A Comprehensive Report

BHANDURA NALA PROJECT

(Mahadayi Diversion)

and Desertification of North Karnataka

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North Karnataka

Save North Karnataka Citizens Alliance

Belagavi-Huballi-Dharwad

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Dedicated to the memory of a visionary
who spearheaded the movement to protect
the Bhimgad Wildlife Sanctuary and its
surrounds for water, food and environmental
security of North Karnataka

Lt Gen S.C. Sardeshpande

AVSM, UYSM, VSM, Rajyotsava Prashasti

(1934-2023)

Munavalli Village, Belagavi

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The authors wish to present this report as a base document, prepared on the principle of trust. All efforts have been made to verify facts and check references. The views expressed are collectively those of the authors and supporters.

FOREWORD

The Mahadayi River Diversion Project is aimed at replenishing the deficit in the River Malaprabha through inter-basin transfer. It is located in the Western Ghats forest of Khanapur taluka in Belagavi District, Karnataka. Its implementation has remained indecisive for the past two and half decades.

The agricultural community at the tail-end of the left bank canal of Naviluteertha Dam on the Malaprabha views the river diversion as an answer to their agricultural water needs. For the ease of obtaining necessary compliance, Karnataka Niravari Nigam Ltd (KNNL), the project execution agency, portrays it as a drinking water project.

The Mahadayi River Diversion Project, in the most recent Detailed Project Report (DPR) of 2022 is presented as two separate smaller projects: 1) The Kalasa – Haltara diversion project (1.72 TMC) at Chorla and Kankumbi villages; 2) The Bhandura Nala Diversion Project (2.18 TMC) at Nersa Village. Both are headwater spring-streams of the Mahadayi, originating in the vicinity of Bhimgad WLS and Mhadei WLS in the Eco Sensitive Zone I of the Western Ghats. These sanctuaries and their adjacent contiguous forests find their place in the WGEEP and HLWG reports of Prof. Madhav Gadgil and late Dr. Kasturirangan respectively, for their ecological sensitivity.

This report deals specifically with the Bhandura Nala Diversion Project and its ecological, economic, socio-cultural, legal, scientific and technical aspects. The analysis categorically points out that the project is untenable in the long term. Additionally, it opens up serious possibilities of advancing the desertification process of North Karnataka region as well as the Malaprabha Basin.

The document progressively goes into details elaborating the complex facts of the issue. It attempts to provide alternatives that are most cost effective and beneficial to sustaining the river systems. These river systems are the backbone of agriculture further downstream in the Malaprabha basin, the North Karnataka region, and beyond.

In the recent months the concerns of local resident communities of villages near the proposed project site are palpable as there is a Gazette Notification under the seal of the Governor of Karnataka for land acquisition of their productive agricultural lands.

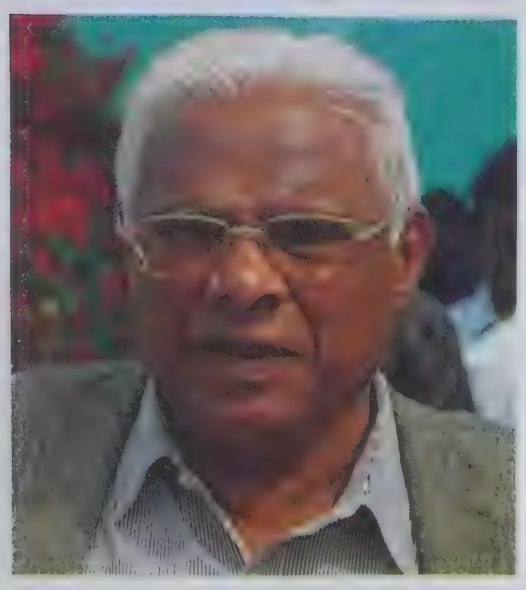
This report is the combined effort of many concerned citizens from Hubli-Dharwad-Belagavi-Khanapur. It collectively represents the voice of resident communities of the Bhimgad region as well as concerns voiced by people of Khanapur and Belagavi taluka, Belagavi city, Hubli-Dharwad-Kittur-Savadatti-M K Hubli, Bagalkot, Ramdurg, Badami etc.

In preparing this document, authors have relied heavily on scientific and research documents and publications of IISc, ATREE, KSNDMA, NIH, ISRO, IMD and others. At the end of the day it is a citizens report open for improvement, feedback, and a healthy discussion in the interest of the cause it is meant to serve.

This report is for the benefit of policy makers, administrators, elected representatives, socio-cultural community heads, grassroots influencers, members of project affected communities, bureaucrats and general public. Most importantly, it is for the people of Belagavi, Bagalkot, Hubli-Dharwad and Gadag District. It is meant to place before everyone well researched facts of the case so that the right decisions can be taken in our collective interest.

Note: *The term "desertification" is used here in its broader sense to denote land and ecosystem degradation rather than literal desert expansion, in line with current UNCCD and SDG 15.3 terminology.*

Endorsements & Considered Views



Dr. A. N. Yellappa Reddy
Bengaluru

Former Secretary, Department of Ecology and Environment, Government of Karnataka
Former Member, Karnataka High Court Lok Adalat

"During my tenure as member of Lok Adalat, the feasibility of the Bhandura Nala project was deliberated upon. Lok Adalat had directed the Regional Commissioner and the Chief Engineer to submit a detailed report. But unfortunately, this report has been suppressed.

We used to refer to this file as Bhanduri Blunders."

G. C. Tallur
Dharwad

Former Secretary, PWD Government of Karnataka
Former Member, Karnataka State Environment Appellate Authority

"...diversion of a mere 2.18 TMC is not the solution but an aggravating factor with adverse ramifications for the entire Malaprabha basin and beyond."

This comprehensive report on the desertification of North Karnataka is a well-researched outcome of efforts of concerned citizens.

The Government of Karnataka must give due importance to this report in the decision making process of Bhandura Nala diversion scheme for it is never too late to now correct any wrong steps initiated concerning Mahadayi diversion project. I find this report based on facts and scientific evidences which if brushed away will only be to the peril of North Karnataka.

Water demands of the existing 10 sugar factories and another 11 coming up are against the project report of Malaprabha Dam. Such being the case, diversion of a mere 2.18 TMC is not the solution but an aggravating factor with adverse ramifications for the entire Malaprabha basin and beyond.

A diversion project affecting deleteriously Bhimgad Wildlife Sanctuary and Mhadei Wildlife Sanctuary requires a serious second look which I hope the Irrigation Department of the Government of Karnataka will take.

Prof. Gopal Kadekodi
Dharwad

Environmental Economist,
Former Director, Institute of Social and Economic Change
Former President, Indian Society of Ecological Economics, Bengaluru
Professor at Centre for Multi-Desciplinary Development Research, Dharwad

> "Major alternatives for Bhandura and Kalasa water diversion are not assessed at all. No economics thinking has gone into the DPR for exactly computing the values for forest loss, both in the short and long run ...
>
> I am totally against this Kalasa and Banduri project."

This report reflects the efforts of its authors in undertaking a detailed scientific study of the Bhandura Nala project. The study reveals that many of the assessment parameters used by the project proponents of Bhandura Nala diversion are based on false or wrong indicators; falsely claiming water shortage in Malaprabha basin. The real problem in this basin is the choice of wrong crops and cropping patterns (sugarcane requiring much higher water than other crops); not opting for minor irrigation options fully; not mandating compulsory rainwater harvesting and recycling of waste water, and so on.

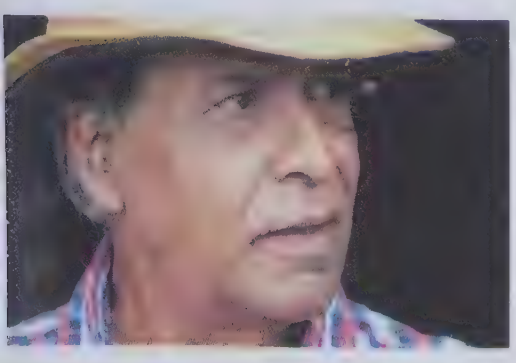
Major alternatives for Bhandura and Kalasa water diversion are not assessed at all. No economics thinking has gone into the DPR for exactly computing the values for forest loss, both in the short and long run; loss of biodiversity and threat to wildlife; loss of cultural values from this region –particularly of the ancient forest dwelling communities.

The estimate of 2.18 TMC for diversion at the cost of over 1000 crore is not at all justifiable. Rather people of Hubli-Dharwad-Bagalkot-Gadag should pay either more for their misuse of water, including penalty for not adopting water efficient agricultural practices and rainwater harvesting methods, or should implement water saving methods compulsorily within a time bound period.

As an urgent line of action, soil cover and water table depletion through destructive land use practices in the Malaprabha river basin should be curtailed,desilting of Naviluteertha dam undertaken, and water thefts should be strictly acted upon. Instead of looking for water from riparian systems within ecologically sensitive areas (as per WG report) we ought to set our house in order first.

Based on the observation of developments over the past few decades it is clear that this project is politically motivated; moved to intensify differences between neighboring states; setting up agitation among the people and farmers, unnecessarily provoking a political battle.

I am totally against this Kalasa and Banduri project.



Suresh Heblikar
Hubballi

Kannada Film Maker
Director, Actor
Renowned Environmentalist
Founder of ECO-Watch NGO

"Nothing should be undertaken that will peril the ecological integrity, sanctity and assured long term benefits which the farmers of the region receive continuously."

Any compromises made by tampering with the ecological integrity of the Bhimgad region spell ruin for farmers not only of Khanapur-Belagavi but also in the neighboring districts of Hubli-Dharwad-Bagalkot-Gadag-Vijaypur. Karnataka's rich cultural moorings have thrived on the bedrock of the forests of the Western Ghats. Our cultural traditions hold a mirror to the important role the forests and mountains play in the everyday life of the people of Karnataka.

Nothing should be undertaken that will peril the ecological integrity, sanctity and assured long term benefits which the farmers of the region receive continuously. These services are far too great in comparison to perceived benefits from projects such as the Bhandura Nala diversion. It should be outright rejected in favor of long term interests of the people of North Karnataka. This comprehensive report makes it amply clear. It should reach the hands of everyone who has the interests of the people of Karnataka in their heart.

T.V. Ramachandra
Bengaluru

Ph.D. (IISc), FIE, FNIE
Head, Energy and Wetlands Research Group CES TE 15Centre for Ecological Sciences, Indian Institute of Science, Bengaluru
Three decades of research work in Central Western Ghat rivers

"The responsibility of every human of the current generation is to ensure intergenerational equity and sustain natural resources..."

The river diversion project on the tributaries of the Mahadayi is a classic case of politically-driven engineering. It fails the local ecology and fails the people it claims to serve.

The responsibility of every human of the current generation is to ensure intergenerational equity and sustain natural resources, which necessitates maintaining the integrity of fragile ecosystems. Now is an opportunity for the current generation to arise, awake, and continue efforts till the goals of conservation are achieved to sustain clean air, water, and environment for the next generation through the complete stoppage of senseless, irresponsible, and unplanned developmental projects in the ecologically sensitive regions (such as Western Ghats, etc.).

Dr. Srinivas Badiger
Bengaluru

Hydrogeologist & Environmental Scientist
Working on issues for over two decades at the interphase of Climate, Water, Agriculture, Environment and Livelihoods
Lead investigator in several multi-institutional collaborative projects focussing on water conflicts, water policy, agrarian crises and climate change. PhD in Water Resources Engineering from Illinois, USA

"As a researcher... I find the report's framing of the links between forests, biodiversity, hydrological flows, and water security to be both accurate and policy-relevant."

It is my pleasure to have reviewed the "Bhandura Nala Project: Comprehensive Report on the Desertification of North Karnataka", a timely and substantive effort to draw policy attention to the ecological and hydrological risks associated with the proposed Bhandura Nala Diversion in the Western Ghats headwaters.

The report effectively consolidates scientific evidence, field observations, legal references, and community voices into a coherent argument for adopting a precautionary, ecosystem-based approach to natural resource governance.

As a researcher working on hydrology, climate and the socio-ecological impacts of intensive irrigated agriculture, I find the report's framing of the links between forests, biodiversity, hydrological flows, and water security to be both accurate and policy-relevant. Its recommendations align well with contemporary scientific understanding and with national policy goals under the SDGs and the draft National Water Policy (2021).

While future iterations may benefit from more risk-based assessments, the report's substance and purpose remain clear. I endorse its conclusions and its call for comprehensive, science-led assessment of hydrological interventions in the Western Ghats. Protecting these headwaters is central to ensuring sustainable water and livelihood security across the region.

Prof. A. R. Vasavi
Bengaluru

Founder of Punarchith, Chamarajanagar
Ph.D. in Social Anthropology from Michigan State University
Author & Visiting Professor at various universities in India and overseas

"Comprehensive and incisive, this report flags the ecological and economic harms that obstructive and diversionary projects on the Mahadayi will entail for both Karnataka and Goa. A must read for all farmers, students, civil society members, legislators, planners, and contractors."

Dr. Rajendra Singh
Alwar

Waterman of India
Magsaysay Awardee

"...Having offered alternatives and flagged the issue of land degradation and progressive aridity in North Karnataka, it becomes imperative we exercise restraint and go by the precautionary principle."

A lot of study and effort has gone into the writing of this report by the citizens' group of Belagavi-Dharwad-Hubli. Having covered all aspects of the effects of the Mahadayi Diversion Project, pertaining to the diversion of its headwaters tributary –Bhandura Nala –the authors have once again brought to light the disastrous and irreversible repercussions such projects being envisaged in the forests of the Western Ghats will have by way of long term impacts. All the concerned governments at the state and centre must take note of this report and seriously rethink of the feasibility of the project from all aspects. Having offered alternatives and flagged the issue of land degradation and progressive aridity in North Karnataka, it becomes imperative we exercise restraint and go by the pre cautionary principle.

नदी जोड़ से आप जंगल का पानी नहीं ला सकते।

मित्रों, उत्तर कर्नाटक को समझने के लिये ये चार चीजें जानना जरूरी हैं। उत्तर कर्नाटक में समुद्र का पानी बादल बनकर आता है और यहाँ आकर बरस जाता है। यदि धरती वृक्ष विहीन है तो गर्मी के कारण बादल ऊपर आकाश में रूठ कर चले जाते हैं और बरसते नहीं हैं। हमारे इलाके में ऐसा ही होता था। बादल रूठ कर चले जाते थे बगैर बरसे।

बत्तीस वर्ष पूर्व जब पानी का कार्य शुरू हुआ तो उद्योग जनित लाल गर्मी हरियाली से समाप्त हो गयी। एक श्रृंखला में 11600 वाटर हार्वेस्टिंग निर्माण बनाये गये थे। उसके कारण भूमि में नमी रहने लगी और हरियाली के पास पूरे वर्ष पानी रहने लगा और उससे भी बादल बनने लगे। पहले बादल केवल समुद्र से बनते थे लेकिन उस हरियाली के कारण, उस इलाके में छोटे बादल भी बनने लगे। अब यह दोनों बादल माक्रो क्लाउड और माइक्रो क्लाउड मिलने से तापक्रम 30 सेल्सियस नीचे आगया। इसके कारण राजस्थान में अब अधिक वर्षा होने लगी है। ऐसा आप रिपोर्ट, समाचार में भी पढ़ते होंगे। 10800 वर्ग किमी में जो हरियाली और नमी बढ़ी है उसके कारण यह इलाका पानीदार हुआ और परिणामस्वरूप और अधिक हरियाली बढ़ी।

न्यायपालिका और पर्यावरणविदों को यह समझना पड़ेगा कि केवल नदी जोड़ने से काम नहीं चलेगा। वस्तुतः नदी जोड़ एक भारत को तोड़ने की एक योजना है। हम सबको नदियों से जुड़ना पड़ेगा। हम नदियों से जुड़ जाते हैं तो हम सबको पानी मिलेगा। हमने राजस्थान में सात मृत सुखी नदियों को जीवित किया। हम किसी का पानी लूटकर नहीं लाये। हमने तो भगवान और प्रकृति प्रदत्त पानी को प्यार और सम्मान दिया और उस पानी को धरती माता के गर्भ में संचित किया। इतना सा काम हमने किया और इससे हम पानीदार बन गये। अब बेलगाम को सोचना है कि वे महादायी का पानी लेकर आयेंगे या अपना पानी बनायेंगे। आपके पास अपना पानी, हमसे दो गुणा ज्यादा है। आपको एकमात्र जल जागृति अभियान में जुट जाना चाहिये। पानी के तकनीकी, सामाजिक, राजनीतिक, सास्कृतिक और आध्यात्मिक पहलू हैं उसमें हम मदद करेगें। कर्नाटक में बहुत अच्छे-अच्छे लोग हैं। उनको समझना होगा कि नदी समुद्र तक तो जानी ही चाहिये। परन्तु नदी का पानी मानव उपयोग हेतु भी है। दोनो पक्षों का संबंध स्थापित करने वाला भी एक विज्ञान है। आपको वह विज्ञान समझना होगा।

लेकिन जहाँ गन्ना नहीं बोना चाहिये वहाँ 18 शुगर मिल लगी हैं। यह कर्नाटक का बिगड़ा रूप है। हमें यह देखना पड़ेगा कि हमें कहाँ गन्ना पैदा करना है और कहाँ नहीं। मैं गन्ने का दुश्मन नहीं हूँ। आप गन्ना पैदा करिये लेकिन जहाँ पानी नहीं हैं वहाँ गन्ना न बोया जाय। मेरे इलाके में जब मृत नदियों में पानी आया तो किसान गन्ना बोने के लिये उद्धत हुए परन्तु आज आपको उस इलाके में कहीं गन्ने की खेती दिखायी नहीं देगी। जहाँ वर्षा नहीं होती और पानी धरती के एकुइकर्स (जलकोषों) को रिचार्ज नहीं करता वहाँ गन्ने की खेती बिल्कुल नहीं होनी चाहिये। उत्तर कर्नाटक के अच्छे भविष्य हेतु निष्पक्ष और वैज्ञानिक दृष्टिकोण की आवश्यकता है।

Sharada Gopal
Dharwad

Activist, Writer, Social Worker
Founder, Jagrutha Mahila Vokkuta, Mangyankop, Beedi, Khanapur

"ಈ ವರದಿಯು ಒಂದು ಪರಿಪೂರ್ಣ ಚಿತ್ರವನ್ನು ಕೊಡುತ್ತದೆ."

ಕಳಸಾ ಬಂಡೂರಿ ಬೇಕು ಎಂಬ ಹೋರಾಟಗಳನ್ನು ನಾವು ಧಾರವಾಡದಲ್ಲಿ ಬಹಳಷ್ಟು ಸಾರೆ ನೋಡುತ್ತಲೇ ಬಂದಿದ್ದೇವೆ. ಕೇವಲ ೭ ಟಿಎಂಸಿ ನೀರನ್ನು ಕೇಳುತ್ತಿದ್ದೇವೆ, ಅದನ್ನೂ ಇವರು ತೆಕ್ಕೊಳ್ಳಲು ಬಿಡುತ್ತಿಲ್ಲ ಎಂದು ಪತ್ರಿಕೆಗಳ ಮುಖ್ಯ ಪುಟಗಳಲ್ಲಿ ಓದಿದ್ದು ಅದೆಷ್ಟೋ ಬಾರಿ. ನದಿ ತಿರುವು ಬೇಡ ಎಂದು ಯಾರಾದರೂ ಹೇಳಲು ಬಂದರೆ ಕೆಲವೇ ಮಂದಿಯನ್ನು ಕೂಡಿಸಿಕೊಂಡು ಗುಟ್ಟಾಗಿ ಸಭೆ ಮಾಡಬೇಕು. ಯಾಕೆಂದರೆ ಅವರಿಗೆ ಗೋವಾದವರ ಬೆಂಬಲವಿದೆ, ಅವರಿಗೆ ಬೇರೆಲ್ಲಿಂದಲೋ ಹಣದ ಬೆಂಬಲವಿದೆ ಎಂದೆಲ್ಲ ಇಲ್ಲಿ ಗುಲ್ಲು.

ಹೀಗಿರುವಾಗ ವಿಚಾರದ ಸ್ವಲ್ಪ ತಿಳುವಳಿಕೆ ಇತ್ತಾದರೂ, ಈ ವರದಿಯು ಒಂದು ಪರಿಪೂರ್ಣ ಚಿತ್ರವನ್ನು ಕೊಡುತ್ತದೆ. ಕಣ್ಣು ತೆರೆಸುತ್ತದೆ. ನದಿ ತಿರುವು, ನದಿಗಳ ಜೋಡಣೆ, ಭಾರತಮಾತೆಗೆ ಹಾರ ಎಂದೆಲ್ಲಮನಸೆಳೆಯುವ ಶಬ್ದಗಳ ಹಿಂದಿರುವ ಕ್ರೂರ ಸತ್ಯವನ್ನು ಈ ವರದಿ ಬಿಚ್ಚಿಡುತ್ತದೆ. ಸ್ವಲ್ಪವೂ ವೈಜ್ಞಾನಿಕ ವಿಶ್ಲೇಷಣೆ ಇಲ್ಲದೆ, ನಿಸರ್ಗಕ್ಕೆ ಏನಾಗಲಿದೆ, ಅದರ ಪರಿಣಾಮ ಕಾಡು ನದಿಗಳನ್ನು ನಂಬಿರುವ ಜೀವ ಸಂಕುಲದ ಗತಿ ಏನಾಗಲಿದೆ ಎನ್ನುವ ಸ್ವಲ್ಪವೂ ಕಾಳಜಿ ಇಲ್ಲದೆ ಮನುಷ್ಯ ನದಿಗಳನ್ನೇ ತಿರುಗಿಸಲು ಹೊರಟಿದ್ದಾನಲ್ಲ!

ಅದೂ ವಾತಾವರಣ ಸಂಕಟದ ಇಂತಹ ದಿನಗಳಲ್ಲಿ? ಯಾರು ಇಂತಹ ಯೋಜನೆಗಳನ್ನು ಹಾಕುವವರು? ಯಾರು ಇಂತಹ ಯೋಜನೆಗಳನ್ನು ಸರಕಾರದ ಮುಂದಿರಿಸುವವರು? ಎಲ್ಲಿಂದ ಬರುತ್ತವೆ ಇಂತಹ ವಿಚಾರಗಳು? ಮನುಷ್ಯನೊಬ್ಬನ ಸಲುವಾಗಿ ಇರುವುದೇ ಈ ಭೂಮಿ? ಮನುಷ್ಯ ಒಬ್ಬನೇ ಆದರೆ ಅವನಿಗೆ ಬದುಕಲು ಸಾಧ್ಯವಿದೆ ಅಂದುಕೊಂಡಿದ್ದಾನೆಯೇ? ಆಸೆಗೆ ಮಿತಿಯೇ ಇಲ್ಲವೇ? ಇಂದು ಬದುಕಿದರೆ ಸಾಕೆ? ನಾಳೆಗೆ ಏನೂ ಬೇಡವೇ? ಪ್ರಕೃತಿಯನ್ನು ಗೆದ್ದು ಬದುಕುವ ಹುಚ್ಚು ಹಂಬಲ ಎಲ್ಲಿಂದ ಬಂತು ಈ ಜನಕ್ಕೆ?

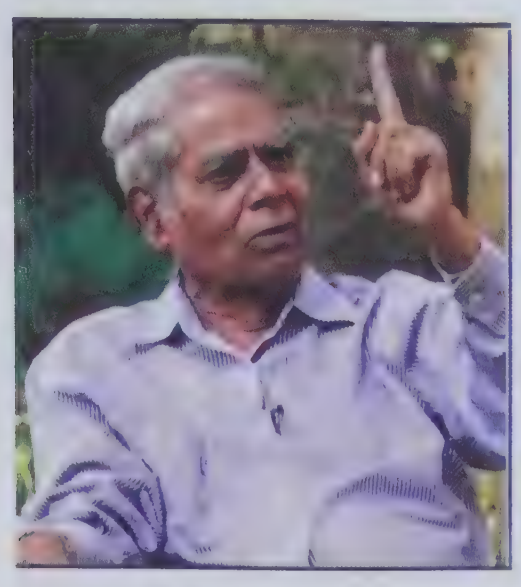
ಭೂಮಿ, ಮಣ್ಣು, ನೀರು, ಪರಿಸರಗಳ ಬಗ್ಗೆ ಚಿಂತಿಸುವ ಕೆಲವರಾದರೂ ನಾವು ಇನ್ನೂ ಬದುಕಿದ್ದೇವೆ. ಇಂತಹ ಹುಚ್ಚು ಯೋಜನೆಗಳ ಬಗ್ಗೆ ಜನರಿಗೆ ಮಾಹಿತಿ ಕೊಡುವ ಕೆಲಸವನ್ನು ಸತತವಾಗಿ ಮಾಡುತ್ತಲೇ ಇರುತ್ತೇವೆ.

Nirmala Gowda
Bengaluru

Activist-Researcher
Editor, Mapping Malnad
(MappingMalnad.com)

"Diverting will surely make the Mahadayi run dry... another river extinct, lost to human greed."

A few years ago, I visited the Kalasa–Bandura project sites, nestled within the dense evergreen forests adjoining the Bhimgad, Mhadei, and Bhagwan Mahaveer Wildlife Sanctuaries –forests so thick that sunlight barely reaches the ground. This is home to the crystal-clear, perennial headwaters of the Mahadayi River. Diverting these will surely make the Mahadayi run dry –another river extinct, lost to human greed. As we live through a human-made sixth mass extinction, protecting headwater streams is a priority. It is time we rethink this project –and our growing greed for water– before it destroys the very sources that make life flow.



S.R. Hiremath
Dharwad

Environment and Anti-Corruption Activist
Founder President, Samaj Parivartana Samudaya (SPS)
Founder President, National Committee for Protection of Natural Resources (NCPNR)
Indira Gandhi Paryavaran Puraskar Recipient-Highest Environmental Honour in the Country

"Everyone interested in the welfare of the people of this region...ought to take serious cognizance... understand the futility of pandering to populist myopic demands."

This Citizens Report based on scientific study followed by a demand for a planned holistic approach to protect the ecological services provided by the forests of the Bhimgad region goes back in its history nearly three decades.

NCPNR and SPS remain committed to supporting such initiatives emerging from local stakeholders and has also been a part of this process for the Western Ghats region since the early 1980s. The Bhimgad Sanctuary proposal accepted by the Government of Karnataka has been a citizen initiative. The Sahyadri Ecologically Sensitive Area proposal of the early 2000s initiated under the leadership of Late Lt Gen S C Sardeshpande also played a central role in setting up a committee for legislative protection to the entire Western Ghats region.

It is well recognized by the scientific and academic community as well as the local people of Khanapur-Belagavi that the Mahadayi Diversion Project is an ill-conceived one.It is now accepted the world over that engineering is not ecology and sustainability. The project is not environmentally prudent nor in the interest of the people of Khanapur- Belagavi and the entire North Karnataka region in the short, medium and long term.

The current report explaining the effects of the Bhandura Nala Diversion makes this abundantly clear. Everyone interested in the welfare of the people of this region and North Karnataka ought to take serious cognizance of it; understand the futility of pandering to populist myopic demands. My unwavering support to the effort stands.

Ashish Kothari
Pune

Environmentalist, Writer, Teacher Co-founder of Kalpavriksh, Vikalp Sangam, Global Tapestry of Alternatives, Radical Ecological Democracy
Served on several Government Committees related to Environment

"Citizens' assessments of so-called 'development' projects have for decades pushed public debate and governmental policy towards greater ecological and social sensitivity. This report continues a tradition of thorough, independent and courageous fact-finding and analysis. It does not stop at critique, but also offers alternative pathways of meeting water and irrigation needs, which should be seriously considered. This will be a solid base for people's movements and civil society action towards genuine sustainability and equity."

Dileep Kamat
Belagavi

Thinker-writer
Social and Political activist
Trainer of community organisation leaders

"There are dozens of untruths which expose the hollowness of the argument of the diversion project."

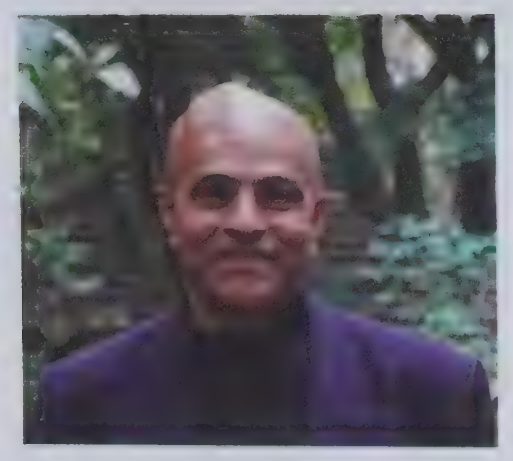
There is wide consensus that the Sahyadri mountain range (Western Ghats) needs to be preserved for the overall health of South India. And yet, the governments of the States and the Union find all sorts of "development" projects which do long term damage to the hottest hot ecological spot of the world as declared by the U.N. One such folly is the Bhandura Nala diversion project.

The report prepared by a group of people from Belagavi and Dharwad area has done a wonderful job of facts and figures which speak for themselves and show how, in the name of drinking water project, the desertification of North Karnataka will be further accelerated.

Just to give an example, the report tells you that nine new sugar factories are waiting in line for permission in the areas where eleven already exist. They are all counting on Malaprabha irrigation. The Govt. of Karnataka is claiming that they need 4 TMC from Mhadei diversion to supply drinking water to Hubli, Dharwad and other villages and towns. There are dozens of such untruths which expose the hollowness of the argument of the diversion project.

What is most gratifying is that the Report also talks of alternatives that are available.

Shall we hope that the report—and its vernacular translation—will educate the general public (particularly the farmers) to pressurise the politicians to choose saner ways to meet water needs without harming the Western Ghats?



Prof. Dr. Aseem Shrivastava
New Delhi,

Environmental Economist by training from the University of Massachusetts
Writer, teacher and ecological thinker
He has taught at universities in India and the West and offered courses on Global and Indian Ecosophy at Ashoka University, Delhi

"The history of modern societies has been shaped by their insatiable competitive drive for the accumulation of capital. In present day parlance it goes by the name of development, progress, power... This comes at the cost of sacrifices made by Nature or the less fortunate amongst us. The Bhandura Nala project holds a mirror to the genesis and grammar of another such misguided misadventure. From the report it is abundantly clear that at times it is necessary to rethink where we wish to head and what we wish to be remembered for."

Dr (Hon) Shivaji Kaganikar
Kattabhavi, Belagavi

Educator
Soil and Water Conservationist
Awarded Honorary Doctorate
by Rural University, Gadag
Rajyotsava Prashasti

> “ ಈ ಯೋಜನೆ ಜಾರಿಯಾಗಿದ್ದೇ ಆದರೆ ಸುತ್ತಮುತ್ತಲಿನ ಪ್ರದೇಶಗಳಲ್ಲಿ ಅರಣ್ಯ ತುಂಬ ಕಡಿಮೆ ಆಗಿ, ನಂತರ ಮಳೆ ಕಡಿಮೆ ಆಗಿ ಎರಡೂ ನದಿಗಳ ಒಳಹರಿವು ಕಡಿಮೆ ಆಗಿ ನೀರಿನ ಕೊರತೆ ಉಂಟಾಗಿ ಬರಗಾಲ ಎದುರಿಸಿ ಮುಂದೊಂದು ದಿನ ಮರುಭೂಮಿ ಆಗುವ ಸಾಧ್ಯತೆ ಇದೆ. ”

ಬೆಳಗಾವಿ, ಖಾನಾಪುರ, ಉತ್ತರ ಕನ್ನಡ ಭಾಗದ ಪಶ್ಚಿಮ ಘಟ್ಟದ ಪ್ರದೇಶಗಳನ್ನು ಉಳಿಸಲು ಶಿವರಾಮ ಕಾರಂತ ಅವರ ನೇತೃತ್ವದಲ್ಲಿ ಪಶ್ಚಿಮ ಘಟ್ಟ ಉಳಿಸಿ ಅಭಿಯಾನ ಆರಂಭಿಸಿದರು.

ಇದೇ ಸಂದರ್ಭದಲ್ಲಿ ಜನರಲ್ ಶ್ರೀ ಕೃಷ್ಣ ಸರದೇಶಪಾಂಡೆ ಅವರ ನೇತೃತ್ವದಲ್ಲಿ ಶ್ರೀ ದಿಲೀಪ ಕಾಮತ ಮತ್ತು ಕರ್ನಲ್ ರವೀಂದ್ರ ಕುಮಾರ್ ಸೈನಿ ಮುಂತಾದವರು ಸೇರಿ ಪರ್ಯಾವರ್ಣ ಸಂಸ್ಥೆಯನ್ನು ಹುಟ್ಟು ಹಾಕಿದರು ಕರ್ನಾಟಕ ಸರ್ಕಾರ ಮಹದಾಯಿ ನದಿಯ ನೀರನ್ನು ಮಲಪ್ರಭಾ ನದಿಗೆ ಹಾರಿಸುವ ಒಂದು ದೊಡ್ಡ ನದಿ ತಿರುವ ಯೋಜನೆಯನ್ನು ರೂಪಿಸಿತು. ಆದರೆ ಈ ಯೋಜನೆ ಜಾರಿಯಾಗಿದ್ದೇ ಆದರೆ ಸುತ್ತಮುತ್ತಲಿನ ಪ್ರದೇಶಗಳಲ್ಲಿ ಅರಣ್ಯ ನಾಶ, ಜನರ ಜೀವನದ ಮೇಲೆ ಪ್ರತಿಕೂಲ ಪರಿಣಾಮ ಉಂಟಾಗುವುದನ್ನು ಮನಗಂಡು ಪರ್ಯಾವರ್ಣ ಸಂಸ್ಥೆಯು ಸತತವಾಗಿ ನೇರಸೇ, ಅಶೋಕ್ ನಗರ ಮುಂತಾದ ಪ್ರದೇಶಗಳಿಗೆ ತನ್ನ ಪ್ರಯತ್ನಗಳ ಮೂಲಕ ನೂರಾರು ಯುವಕರನ್ನು ಸಂಘಟಿಸಿ ಶಕ್ತಿ ತುಂಬುವ ಕೆಲಸ ಮಾಡಿತು.

ನಿವೃತ್ತಿಯ ವಯಸ್ಸಿನಲ್ಲೂ ಕೂಡ ಜಾಂಬೋಟಿಯ ಗುಡ್ಡಗಾಡುಗಳನ್ನು ಹತ್ತಿ ಇಳಿದು ಆಗಿನ ಎಂ ಎಲ್ ಎ ಅಶೋಕ್ ಪಾಟೀಲ ಅವರು ಇವರ ಹುಮ್ಮಸ್ಸನ್ನು ಕೊಂಡಾಡಿದರು. ಮಹದಾಯಿ ಯೋಜನೆ ಕೆಲ ಕಾಲ ಸ್ಥಗಿತವಾಗಿ ನಿಷ್ಪ್ರಯೋಜಕ ಎಂದು ಮನನವಾದರೂ ಕರ್ನಾಟಕ ಸರ್ಕಾರ ಕಳಸಾ ಬಂಡೂರು ನಾಲೆಗಳಿಗೆ ಅಣೆಕಟ್ಟು ನಿರ್ಮಾಣಕ್ಕೆ ಮುಂದಾಗಿ ಮಲಪ್ರಭಾ ನದಿಗೆ ನೀರು ಹರಿಸಿ ನವಿಲುತೀರ್ಥ ಅಣೆಕಟ್ಟನ್ನು ತುಂಬಿಸಿ ಹುಬ್ಬಳ್ಳಿ ಧಾರವಾಡ ನಗರಗಳಿಗೆ ನೀರು ಸರಬರಾಜು ಮಾಡುವ ಕಾರಣ ಹೇಳಿ ಈ ಯೋಜನೆಯನ್ನು ಪ್ರತಿಪಾದಿಸುತ್ತ ಬಂದಿದೆ. ಆದರೆ ಈ ಯೋಜನೆ ಜಾರಿಯಾಗಿದ್ದೇ ಆದರೆ ಸುತ್ತಮುತ್ತಲಿನ ಪ್ರದೇಶಗಳಲ್ಲಿ ಅರಣ್ಯ ತುಂಬ ಕಡಿಮೆ ಆಗಿ, ನಂತರ ಮಳೆ ಕಡಿಮೆ ಆಗಿ ಎರಡೂ ನದಿಗಳ ಒಳಹರಿವು ಕಡಿಮೆ ಆಗಿ ನೀರಿನ ಕೊರತೆ ಉಂಟಾಗಿ ಬರಗಾಲ ಎದುರಿಸಿ ಮುಂದೊಂದು ದಿನ ಮರುಭೂಮಿ ಆಗುವ ಸಾಧ್ಯತೆ ಇದೆ.

ಮಹಾರಾಷ್ಟ್ರದ ಅಹ್ಮದನಗರ ಜಿಲ್ಲೆಯಲ್ಲಿ ಇರುವ ರಾಲೆಗನಸಿದ್ಧಿ ಊರಿನಲ್ಲಿ ಅಣ್ಣಾ ಹಜಾರೆ ಅವರು ಸುಸ್ಥಿರ ಜಲಾನಯನ ಪ್ರದೇಶ ಅಭಿವೃದ್ಧಿ ಪಡಿಸಿ ಯಶಸ್ವಿ ಆಗಿದ್ದು ಎಲ್ಲರಿಗೂ ಗೊತ್ತಿದೆ. ಊರು ಬಿಟ್ಟು ಹೋದ ಜನ ಮರಳಿ ಬರುತ್ತಿದ್ದಾರೆ. ನಮ್ಮದೇ ಆದ ಬೆಳಗಾವಿಯ ತಾಲ್ಲೂಕಿನ ಕಟ್ಟಣಭಾವಿ ಗ್ರಾಮದಲ್ಲಿ ನಮ್ಮ ಶಿವಾಜಿ ಅಣ್ಣಾ ಕಾಗನಿಕರ ಅವರ ನೇತೃತ್ವದಲ್ಲಿ ಮಾಡಿದ ಇದೆ ತರಹದ ಕಾರ್ಯಕ್ರಮ ಯಶಸ್ವಿ ಆಗಿ ಇಂದು ಅಲ್ಲಿ ಎಲ್ಲಾ ಬಾವಿಗಳಲ್ಲಿ ವರ್ಷವಿಡೀ ನೀರು ತುಂಬಿ ಹರಿಯುತ್ತಿದೆ . ಈ ತರಹ ಹುಬ್ಬಳ್ಳಿ ಧಾರವಾಡ ನಗರಗಳಲ್ಲಿ ಕೂಡ ಸುಸ್ಥಿರ ಜಲಾನಯನ ಅಭಿಯಾನ, ಅಭಿವೃದ್ಧಿ ಮಾಡಿದ್ದೇ ಆದಲ್ಲಿ ನೀರಿನ ಸಮಸ್ಯೆಯನ್ನೂ ಬಗೆ ಹರಿಸಿ ಕಾಡನ್ನು ಉಳಿಸಬಹು. ಆಗ ಈ ಯೋಜನೆ ಅನವಶ್ಯಕ

Suresh Desai
Bedkihal, Belagavi

Innovative State of Art
Agriculture Scientist
Krushi Pandit Awardee

"ಬಂಡೂರಿ ನಾಲಾವನ್ನು ಬೇರೆಡೆಗೆ ತಿರುಗಿಸುವುದು ಮತ್ತೊಂದು ಅಪಾಯಕಾರಿ ಪ್ರಕರಣವಾಗಿದೆ."

"Our earth is a fine balance of *Panchamahabhootas*. Any disturbance to this has disastrous consequences."

ನಮ್ಮ ಭೂಮಿಯು ಪಂಚಮಹಾಭೂತಗಳ ಉತ್ತಮ ಸಮತೋಲನವಾಗಿದೆ. ಇದಕ್ಕೆ ಯಾವುದೇ ಅಡಚಣೆಯನ್ನುಂಟು ಮಾಡುವುದು ಹಾನಿಕಾರಕ ಪರಿಣಾಮಗಳಿಗೆ ಕಾರಣವಾಗುತ್ತದೆ. ಜಾಗತಿಕ ತಾಪಮಾನ ಏರಿಕೆ ಮತ್ತು ಹವಾಮಾನ ಬದಲಾವಣೆಯು ಅಂತಹವುಗಳಲ್ಲಿ ಒಂದಾಗಿದೆ. ನಾವು ಪದೇ ಪದೇ ನಿಸರ್ಗದ ಸಮತೋಲನವನ್ನು ತೊಂದರೆಗೊಳಿಸುತ್ತಲೇ ಇರುತ್ತೇವೆ. ಪಂಜಾಬ್‌ನಲ್ಲಿ ಹಸಿರು ಕ್ರಾಂತಿಯ ಹೆಸರಿನಲ್ಲಿ ಮಾಡಲಾದ ಏಕಸಂಸ್ಕೃತಿ ಕೃಷಿಯ ಅಭಿವೃದ್ಧಿಯು ಹಾನಿಕಾರಕ ಪರಿಣಾಮಗಳನ್ನು ಬೀರಿರುವುದಕ್ಕೆ ಇತ್ತೀಚಿನ ಉದಾಹರಣೆಯಾಗಿದೆ. ಏಕಸಂಸ್ಕೃತಿ ಬೆಳೆಗಳು ಭೂಮಿಯನ್ನು ಹಾಳುಮಾಡಿವೆ. ರಸಗೊಬ್ಬರಗಳು ಮತ್ತು ಕೀಟನಾಶಕಗಳ ಬಳಕೆ ಹಾಗೂ ಕೊಳವೆಬಾವಿಗಳ ಮುಖಾಂತರ ಅಂತರ್ಜಲವನ್ನು ಹೊರತೆಗೆಯುವಿಕೆಯಿಂದ ಈ ಭಾಗದ ಭೂಮಿ ತನ್ನ ಗುಣಮಟ್ಟವನ್ನು ಕಳೆದುಕೊಂಡಿದೆ. ಈ ಪ್ರದೇಶವನ್ನು ಆರ್ದ್ರ ನಿರ್ಜಲೀಕರಣ (ಅರೆಮರುಭೂಮಿ) ಪ್ರದೇಶವಾಗಿ ಪರಿವರ್ತನೆಗೊಂಡಿದ್ದು ಅಲ್ಲಿ ಕ್ಯಾನ್ಸರ್ ಸೇರಿದಂತೆ ತೀವ್ರ ಆರೋಗ್ಯ ಸಮಸ್ಯೆಗಳು ಹೆಚ್ಚಾಗುತ್ತಲೇ ಸಾಗಿವೆ.

ರೈತರು ಸೂಕ್ತ, ಸುರಕ್ಷಿತ ಮತ್ತು ಆರ್ಥಿಕವಾಗಿ ಪ್ರಯೋಜನಕಾರಿಯಾಗುವ ಚಟುವಟಿಕೆಗಳನ್ನು ಪುನಃಸ್ಥಾಪಿಸಿಕೊಳ್ಳುವಂತೆ ಸಹಾಯ ಮಾಡಲು ಪಂಜಾಬ್‌ನಲ್ಲಿ ಹಲವಾರು ವರ್ಷಗಳಿಂದ ನಾನು ವ್ಯಾಪಕವಾಗಿ ಕೆಲಸ ಮಾಡುತ್ತಿದ್ದೇನೆ. ೧೯೯೦ ರ ದಶಕದ ಆರಂಭದಲ್ಲಿ, ನಾನು ಕಬ್ಬು ಬೆಳೆಯುವ ತಂತ್ರವನ್ನು ಅಭಿವೃದ್ಧಿಪಡಿಸಿದೆ, ಇದು ಸೂರ್ಯನ ಬೆಳಕು, ತೇವಾಂಶ, CO_2 (ನೆಲಮಟ್ಟದ ಗಾಳಿ) ಬಳಕೆಯನ್ನು ಗರಿಷ್ಠಗೊಳಿಸುತ್ತದೆ, ಮಣ್ಣಿನ ಆರೋಗ್ಯವನ್ನು ಪುನರುಜ್ಜೀವನಗೊಳಿಸುತ್ತದೆ, ನೀರಿನ ಧಾರಣಶಕ್ತಿಯನ್ನು ಹೆಚ್ಚಿಸುತ್ತದೆ ಮತ್ತು ಪರಿಸರ ಸ್ಥಿರತೆಗೆ ಸಹಾಯ ಮಾಡುತ್ತದೆ. ಈ ತಂತ್ರ (ಅನುಬಂಧವನ್ನು ನೋಡಿ) ಹೆಚ್ಚು ಪರಿಣಾಮಕಾರಿ ಎಂದು ಸಾಬೀತಾಗಿದೆ ಮತ್ತು ಈಗ ಪ್ರಪಂಚದ ವಿವಿಧ ಭಾಗಗಳಲ್ಲಿ ಯಶಸ್ವಿಯಾಗಿ ಅಳವಡಿಸಲಾಗುತ್ತಿದೆ.

ಬಂಡೂರಿ ನಾಲಾವನ್ನು ಬೇರೆಡೆಗೆ ತಿರುಗಿಸುವುದು ಅಂತಹ ಮತ್ತೊಂದು ಅಪಾಯಕಾರಿ ಪ್ರಕರಣವಾಗಿದೆ. ಮಳೆಯನ್ನು ಸೃಷ್ಟಿಸುವ ಕಾಡುಗಳಿಂದ ನೀರನ್ನು ಬೇರೆಡೆಗೆ ತಿರುಗಿಸುವುದು ಪಂಚಮಹಾಭೂತ ವ್ಯವಸ್ಥೆಯಲ್ಲಿ ಬಲವಂತದ ಹಸ್ತಕ್ಷೇಪವಾಗಿದ್ದು ನಿಸರ್ಗದ ಹಾನಿಗೆ ಕಾರಣವಾಗುತ್ತದೆ. ಅದನ್ನು ಯಾವ ಉದ್ದೇಶಕ್ಕಾಗಿ ಅನುಷ್ಠಾನ ಮಾಡಲಾಗುತ್ತಿದೆಯೋ ಆ ಪ್ರಯೋಜನವನ್ನು ಹೀಗೆ ಮಾಡುವುದರಿಂದ ಪಡೆಯಲಾಗುವುದಿಲ್ಲ. ಮಲಪ್ರಭಾ ಜಲಾನಯನ ಪ್ರದೇಶದಲ್ಲಿ ನೀರಿನ ಕೊರತೆಯ ಸಮಸ್ಯೆಗಳಿಗೆ ಬೇರೆ ಹಲವು ಆಯ್ಕೆಗಳಿರುವಾಗ ಇಂತಹ ಅಪಾಯಕಾರಿ ಯೋಜನೆಗೆ ಕೈ ಹಾಕುವುದು ಸಮಂಜಸವೆನಿಸುವುದಿಲ್ಲ.

ಇಂದು ಸಮೃದ್ಧವಾಗಿರುವ ಮಲಪ್ರಭಾ ನದಿಯು ಕಬ್ಬಿನ ಏಕಸಂಸ್ಕೃತಿ ಬೆಳೆಗಾರಿಕೆಯ ಕಾರಣಕ್ಕಾಗಿ ಭೂಮಿಯೊಳಗಿನ ನೀರನ್ನು ಅತಿಯಾದ ಪ್ರಮಾಣದಲ್ಲಿ ಹೊರತೆಗೆಯುವುದರಿಂದ ನೀರಿನ ಕೊರತೆಯನ್ನು ಎದುರಿಸಬೇಕಾಗುತ್ತದೆ. ಭೂಮಿಯ ಗುಣಮಟ್ಟ ಅವನತಿ ಹೊಂದುತ್ತಿದ್ದು, ಭೂಮಿಯೊಳಗೆ ನೀರಿನ ಇಂಗುವಿಕೆ ಕಡಿಮೆಯಾಗಿದೆ. ಆದರೆ ನೀರಿನ ಬಳಕೆ ಹೆಚ್ಚುತ್ತಿದೆ ಮತ್ತು ಅದರಿಂದ ಉಂಟಾಗುವ ಕೊರತೆಯನ್ನು ಇನ್ನಿತರ ಜಲಮೂಲಗಳಿಂದ ಪೂರೈಸಿಕೊಳ್ಳಲಾಗುತ್ತಿದೆ.

ಕಬ್ಬಿನ ಬೆಳೆಗಾರಿಕೆಗಾಗಿ ಬಳಸಲಾಗುವ ೧೪೦ ಟಿಎಂಸಿ ನೀರಿನಲ್ಲಿ, ೫೦ ಟಿಎಂಸಿ ಅಳಿದುಳಿದ ನೀರಿನಿಂದ ಬರುತ್ತದೆ, ಅನುಬಂಧದಲ್ಲಿ ವಿವರಿಸಿದ ವಿಧಾನಗಳನ್ನು ಬಳಸಿದರೆ ೭೦ ಟಿಎಂಸಿಗಿಂತ ಹೆಚ್ಚು ನೀರಿನ ಉಳಿತಾಯವನ್ನು ಸಾಧಿಸಬಹುದು. ಇದು ನೆಲದಿಂದ ನೀರನ್ನು ಹೊರತೆಗೆಯುವುದನ್ನು ನಿಲ್ಲಿಸುತ್ತದೆ. ಮಲಪ್ರಭಾ ಜಲಾನಯನ ಪ್ರದೇಶದಲ್ಲಿ ೩೨೨ ಟಿಎಂಸಿ ಮಳೆ ಇಳುವರಿ ಇದ್ದರೂ, ಹರಿವು ಮತ್ತು ಆವಿಯಾಗುವಿಕೆಯಿಂದ ನಷ್ಟವಾಗುವುದರಿಂದ ಕೇವಲ ೮೦ ಟಿಎಂಸಿ ಮಾತ್ರ ಬಳಕೆಗೆ ಲಭ್ಯವಾಗಿದೆ. ಈ ತಂತ್ರವನ್ನು ಒಣ ಬೆಳೆ ಭೂಮಿಯಲ್ಲಿ ಬಳಸಿದರೆ, ಅದು ಇಂಗುವಿಕೆಯನ್ನು ಮತ್ತಷ್ಟು ಹೆಚ್ಚಿಸುತ್ತದೆ ಮತ್ತು ಆವಿಯಾಗುವಿಕೆಯನ್ನು ಕಡಿಮೆ ಮಾಡುತ್ತದೆ, ಇದರ ಪರಿಣಾಮವಾಗಿ ಒಟ್ಟಾರೆ ಮಳೆನೀರಿನಲ್ಲಿ ಲಭ್ಯತೆ ಹೆಚ್ಚಳವಾಗುತ್ತದೆ.

ಈ ತಂತ್ರವು ಕಬ್ಬು ಕೃಷಿ ಮಾಡದ ಪ್ರದೇಶಗಳಲ್ಲಿ ಮತ್ತು ಮಲಪ್ರಭಾ ಜಲಾನಯನ ಪ್ರದೇಶದ ಒಣ ಭೂಮಿಯಲ್ಲಿ ಮುಂಗಾರು ಮತ್ತು ಹಿಂಗಾರು ಬೆಳೆಗಳ ಕೃಷಿ ಇಳುವರಿಯನ್ನು ಹೆಚ್ಚಿಸುತ್ತದೆ, ಇದರಿಂದಾಗಿ ರೈತರ ಆದಾಯ ಹೆಚ್ಚಾಗುತ್ತದೆ. ೧೯೯೦ ರ ದಶಕದಲ್ಲಿ ಸ್ಥಳೀಯವಾಗಿ ಅಭಿವೃದ್ಧಿಪಡಿಸಿದ ಮತ್ತು ಯುಎನ್‌ಡಿಪಿ ಗುರುತಿಸಿದ ಮತ್ತು ದಾಖಲಿಸಿದ ಈ ತಂತ್ರವು ಅನೇಕ ಕಬ್ಬು ಬೆಳೆಯುವ ದೇಶಗಳಲ್ಲಿನ ರೈತರಿಗೆ ಪ್ರಯೋಜನವನ್ನು ನೀಡಿದೆ. ಮಲಪ್ರಭಾ ಜಲಾನಯನ ಪ್ರದೇಶದಲ್ಲಿ ಈ ತಂತ್ರವನ್ನು ಅಳವಡಿಸಿಕೊಳ್ಳುವುದರಿಂದ ಜಲಚರ ಕುಸಿತ, ಆರ್ದ್ರ ಮರುಭೂಮಿಕರಣವನ್ನು ತಪ್ಪಿಸುತ್ತದೆ ಮತ್ತು ನಮ್ಮ ಕಾಡುಗಳಿಂದ ೪ ಟಿಎಂಸಿ ನೀರನ್ನು ಬೇರೆಡೆಗೆ ತಿರುಗಿಸುವ ಅಗತ್ಯವನ್ನು ತಪ್ಪಿಸುತ್ತದೆ.

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"ಇದು ಅಮೃತ ಸಮಾನ ಪ್ರದೇಶ... ಹವಾಮಾನ ಮತ್ತು ಸಮೃದ್ಧ ಮಣ್ಣಿನ ಪರಿಸ್ಥಿತಿಗಳು ಉತ್ತಮ ಮುಂಗಾರು ಮತ್ತು ಹಿಂಗಾರು ಫಸಲುಗಳನ್ನು ಖಾತರಿಪಡಿಸುತ್ತವೆ."

"Research has provided us with enough solutions and innovations for good agriculture. There is no need for intrusive and destructive activities such as river diversion projects that will have irreversible consequences locally; spilling over to the *Bailu Seeme* region as well."

ಖಾನಾಪುರ ತಾಲ್ಲೂಕಿನ ಪಶ್ಚಿಮ ಭಾಗ, ವಿಶೇಷವಾಗಿ ಅರಣ್ಯ ಪ್ರದೇಶ, ನಮ್ಮ ದಿವ್ಯ ಭೂಮಿ. ಈ ಪ್ರದೇಶದ ಜನರನ್ನು ಮಾತ್ರವಲ್ಲದೆ ಬೆಳಗಾವಿ, ಧಾರವಾಡ, ಬಾಗಲಕೋಟೆ, ವಿಜಾಪುರ, ಗದಗ ಜಿಲ್ಲೆಗಳ ಹವಾಮಾನ ಮತ್ತು ಜಲವಿಜ್ಞಾನದ ಚಕ್ರಗಳ ಮೇಲೆ ಪ್ರಭಾವ ಬೀರುವ ನೈಸರ್ಗಿಕ ಗುಣಗಳಿಂದ ಕೂಡಿದೆ.

ಉತ್ತರ ಕರ್ನಾಟಕದ ಸಮಗ್ರ ಪ್ರದೇಶಕ್ಕೆ ಪರಿಸರ ಸ್ಥಿರತೆಯನ್ನು ಒದಗಿಸುವಲ್ಲಿ ಭೀಮಗಡ ಕಾಡುಗಳು ವಹಿಸಿರುವ ನಿರ್ಣಾಯಕ ಪಾತ್ರವನ್ನು ಗಮನಿಸಿದಾಗ, ಇಲ್ಲಿನ ನಿಸರ್ಗದ ಮೇಲೆ ಮಾಡಲಾಗುವ ಯಾವುದೇ ರೀತಿಯ ಬಾಹ್ಯ ಹಸ್ತಕ್ಷೇಪಗಳು ನೈಸರ್ಗಿಕ ಅಸಮತೋಲನಕ್ಕೆ ನಾಂದಿಯಾಗುತ್ತವೆ ಮತ್ತು ಇತರ ಪ್ರದೇಶಗಳಲ್ಲಿ ಮೇಲೆಯೂ ಅವು ತಮ್ಮ ಪರಿಣಾಮ ಬೀರುತ್ತವೆ.

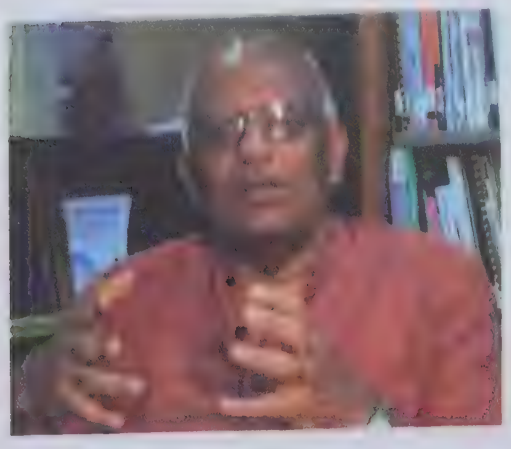
ಈ ಪ್ರದೇಶದ ನಾವು ಸಮುದ್ರಕ್ಕೆ ಬಹಳ ಹತ್ತಿರದಲ್ಲಿ ವಾಸಿಸುತ್ತೇವೆ. ಬೆಳಗಾವಿ–ಖಾನಾಪುರ ಪ್ರದೇಶಗಳು ಅರಬ್ಬೀ ಸಮುದ್ರದಿಂದ ಕೇವಲ ೧೦೦–೧೫೦ ಕಿ.ಮೀ ದೂರದಲ್ಲಿದೆ. ಪಶ್ಚಿಮ ಘಟ್ಟಗಳು ಸಮುದ್ರದ ಕಡೆಯಿಂದ ಉದ್ಭವಿಸುವ ಬಲವಾದ ಗಾಳಿ ಮತ್ತು ಹವಾಮಾನದ ತುದಿಗಳಿಂದ ಪೂರ್ವಭಾಗವನ್ನು ರಕ್ಷಿಸುತ್ತವೆ

ಈ ಪ್ರದೇಶದ ಸೂಕ್ಷ್ಮ ಹವಾಮಾನವು ಖಾನಾಪುರ–ಬೆಳಗಾವಿ ಸಮಂಜಸವಾಗಿ ಉತ್ತಮ ಹವಾಮಾನ, ನೀರು ಮತ್ತು ಸ್ಥಿರವಾದ ಜಲವಿಜ್ಞಾನದ ಚಕ್ರವನ್ನು ಹೊಂದಿದೆ ಎಂಬುದನ್ನು ಖಚಿತಪಡಿಸಿದೆ. ಮುಂಗಾರು ಮತ್ತು ಹಿಂಗಾರು ಬೆಳೆಗಳಿಗೆ ನಮ್ಮಲ್ಲಿ ಸ್ಥಿರವಾದ ಋತುವಿದೆ. ಮತ್ತು ನೀರಿನ ಮಟ್ಟ ಕಡಿಮೆಯಾಗಲು ಪ್ರಾರಂಭಿಸುತ್ತಿದ್ದಂತೆ, ಬೇಸಿಗೆಯ ಮಳೆಯು ಬರುವುದರಿಂದ ಮುಂಗಾರು ಋತುವಿಗೆ ಕೃಷಿಭೂಮಿಗಳನ್ನು ಸಿದ್ಧಪಡಿಸಲು, ಭತ್ತದ ಗದ್ದೆಗಳನ್ನು ಹದಗೊಳಿಸಲು ಅನುಕೂಲಕರವಾಗಿದೆ.

ನಮ್ಮ ಕಾಡುಗಳು ಜೈವಿಕ–ವೈವಿಧ್ಯಮಯ ಸಸ್ಯ, ಪ್ರಾಣಿ ಮತ್ತು ಔಷಧೀಯ ಸಸ್ಯಗಳ ಸಂಗ್ರಹಾಲಯವಾಗಿವೆ. ದವಸ ಧಾನ್ಯದ ಸಮೃದ್ಧ ಆಹಾರ ಧಾನ್ಯ ವೈವಿಧ್ಯತೆಯಿದೆ. ಇದು ಅಮೃತ ಸಮಾನ ಪ್ರದೇಶ. ಇದು ನಮಗೆ ಶುದ್ಧ ಗಾಳಿ, ಸಮೃದ್ಧವಾಗಿರುವ ಮಣ್ಣು ಮತ್ತು ಸೂಕ್ಷ್ಮ ಸಸ್ಯ–ಪ್ರಾಣಿಗಳನ್ನು ಒದಗಿಸುತ್ತದೆ. ಹವಾಮಾನ ಮತ್ತು ಸಮೃದ್ಧ ಮಣ್ಣಿನ ಪರಿಸ್ಥಿತಿಗಳು ಉತ್ತಮ ಮುಂಗಾರು ಮತ್ತು ಹಿಂಗಾರು ಫಸಲುಗಳನ್ನು ಖಾತರಿಪಡಿಸುತ್ತವೆ.

ಪರ್ವತಗಳು ನೀರನ್ನು ಹಿಡಿದಿಟ್ಟುಕೊಳ್ಳುವಲ್ಲಿ ಮತ್ತು ಜಲಚರಗಳನ್ನು ಮರುಪೂರಣಗೊಳಿಸುವಲ್ಲಿ ಪ್ರಮುಖ ಪಾತ್ರವಹಿಸುತ್ತವೆ. ಕಾಡುಗಳು ಜೀವ ಸಂತುಲನವನ್ನು ತರುತ್ತವೆ. ಖಾನಾಪುರ ತಾಲ್ಲೂಕಿನ ರೈತ ಸಮುದಾಯಕ್ಕೆ ನಮ್ಮ ಕಾಡುಗಳು ಆಧಾರ ಮತ್ತು ಆಶ್ರಯಗಳಾಗಿವೆ.

ಈ ಭೂಮಿ ಉತ್ತಮ ಕೃಷಿಗಾಗಿ ನಮಗೆ ಸಾಕಷ್ಟು ಪೂರಕ ವಾತಾವರಣವನ್ನು ಮತ್ತು ನಾವೀನ್ಯತೆಗಳನ್ನು ಒದಗಿಸಿದೆ ಎಂದು ಸಂಶೋಧನೆಗಳು ಸಾಬೀತು ಪಡಿಸುತ್ತವೆ. ಇಂಥ ಅಪರೂಪದ ಪ್ರದೇಶದಲ್ಲಿ ಬದಲಾಯಿಸಲಾಗದ ಪರಿಣಾಮಗಳನ್ನು ಬೀರುವ ನದಿ ತಿರುವು ಯೋಜನೆಗಳಂತಹ ನಿಸರ್ಗದಲ್ಲಿ ಹಸ್ತಕ್ಷೇಪ ಮಾಡುವ ಮತ್ತು ವಿನಾಶಕಾರಿ ಚಟುವಟಿಕೆಗಳ ಅಗತ್ಯವಿಲ್ಲ. ಹಾಗೆ ಮಾಡಿದರೆ ಅದರ ದುಷ್ಪರಿಣಾಮ ಬಯಲುಸೀಮೆ ಪ್ರದೇಶಕ್ಕೂ ಹರಡುತ್ತದೆ.



Sagar Dhara
Hyderabad

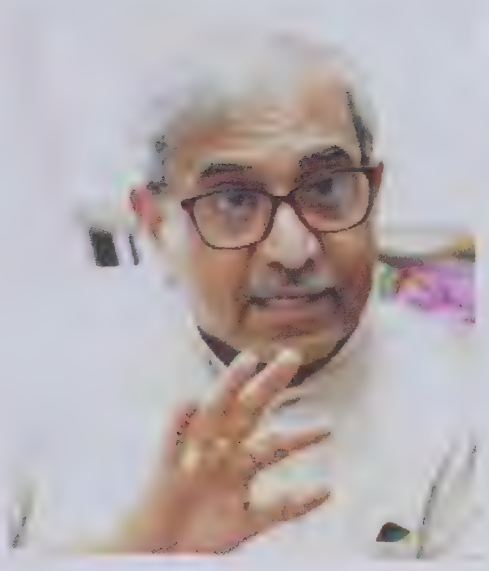
Environmental Scientist
Founder, South Asia Peoples Action on Climate Crisis

"In the Bhimgad region, holistic risk minimization strategies must direct policy decisions...This project is unnecessary and should be dropped forthwith, and similar projects should not be conceived in future."

The multiple converging environmental crises of the 21st century climate change, increasing air and water pollution, desertification, and peak oil demand that long term perspectives are imperative to address global and local environmental concerns.

The Western Ghats, a recognized global ecological hotspot, requires immediate protection as an ecologically sensitive area, with appropriate measures that prevent unnecessary disturbance to its geology and biodiversity. The 2024 Wayanad Landslide Disaster that killed more than 300 persons is a consequence of interference with the local environment of the Western Ghats by replacing original forests with plantations, coupled with an extreme rainfall event, a consequence of interference with the environment at the global level due to excess greenhouse gas emissions that are the primary cause of climate change.

In the Bhimgad region, holistic risk minimization strategies must direct policy decisions. Implementing the proposed Bhandura Nala diversion project will have irreversible long term impact on the Western Ghats and the eco-system services it provides. This project is unnecessary and should be dropped forthwith, and similar projects should not be conceived in future.

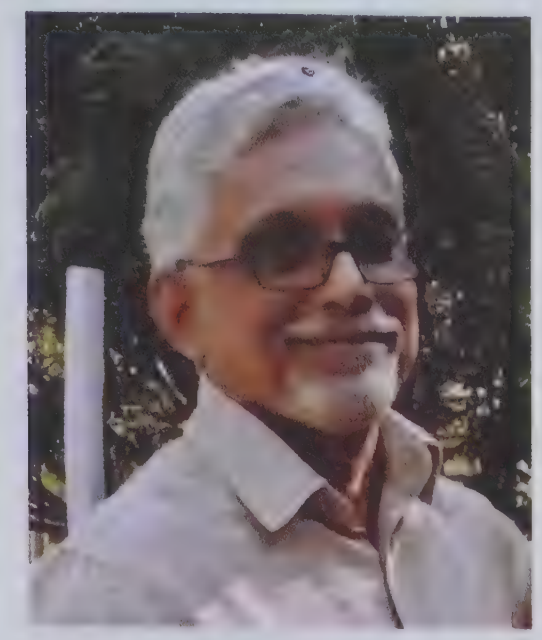


Sudarshan Iyengar
Dharmapur, Valsad

Former Vice Chancellor,
Gujarat Vidyapith, Ahmedabad
Former President, Indian Society for Ecological Economics (INSEE)

"A generation that ignores its predecessors' mistakes dooms itself to condemnation by those that follow."

A generation that ignores its predecessors' mistakes dooms itself to condemnation by those that follow. The Mahadayi River Diversion Project exemplifies this folly. Its Bhandura Nala component has been rigorously assessed, revealing severe ecological damage to communities and ecosystems alike. The looming spectre of desertification will only compound the burdens on future generations—a stark embodiment of intergenerational inequity.



Dr. Prakash Bhat
Dharwad

Author, Teacher
Rajyotsava Awardee for Agriculture and Environment
Worked extensively in villages of Karnataka on issues of drought, farmer livelihood, rural transformation
Former Chief Programme Coordinator, BAIF Development Research Foundation
Member, Executive Council, Honorary Professor, Mahatma Gandhi Rural Development and Panchayat Raj University, Gadag

> "What begins as an engineering project often ends as an ecological disaster."

Rivers like Mahadayi are the lifelines of our planet. They shape landscapes, nurture ecosystems, and sustain countless communities. Yet, across the world, rivers are being dammed, diverted, and drained in the name of development. When we force a river to change its course, we disrupt far more than just water — we disturb the balance of life itself.

Nature Out of Balance:

A river's flow supports fish, birds, plants, and entire forests. When it's diverted, the water that once gave life begins to vanish. Wetlands dry up, fish disappear, and wildlife loses its home. What begins as an engineering project often ends as an ecological disaster.

Downstream Lives at Risk:

Communities living downstream rely on steady river flow for drinking water, farming, and daily life. Diverting a river leaves these areas dry, making fertile lands barren and forcing people to migrate. What helps one region can silently destroy another.

The Soil Loses Its Strength:

Rivers carry sediments—nature's fertilizer—that keep soil rich and farms productive. When we stop this flow, the land turns poor and unyielding. Without these natural nutrients, agriculture suffers, and food security declines.

More Floods, More Erosion:

Ironically, trying to control a river often makes it uncontrollable. Changed flows increase floods in some areas and cause droughts in others. Erosion eats away at riverbanks, damaging farms, homes, and infrastructure.

Human and Cultural Loss:

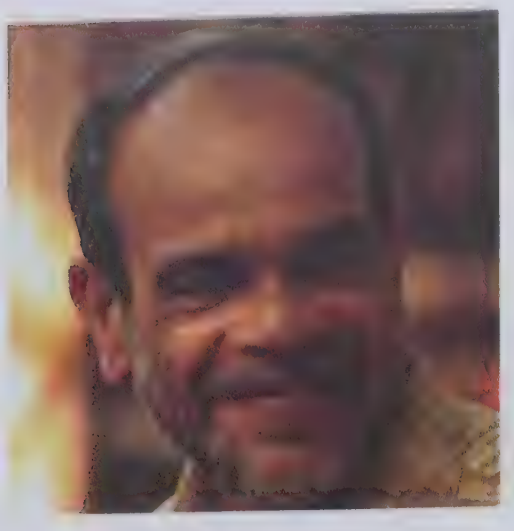
For centuries, rivers have been central to local traditions, festivals, and livelihoods. When they disappear or lose their flow, we don't just lose water — we lose a part of our identity and heritage.

A Call to Protect Our Rivers

Every river has its own rhythm, its own path. Respecting that flow is respecting life itself. Instead of diverting rivers, let's:

- Restore catchment areas and wetlands
- Harvest rainwater locally
- Use water wisely and fairly
- Support policies that protect river ecosystems

Remember: A river diverted is a life disturbed. Let it flow — for nature, for people, for the future.



Pandurang Hegde
Sirsi

Veteran Environmentalist best known for starting the Appiko Movement and his opinion columns in Newspapers
Recipient of numerous awards for his work on pressing for protection of the Western Ghats

> "This report exposes the false assumptions made by the government to divert Bhandura Nala that is solely driven by political and financial interest."

Mahadayi literally means 'the mother.' It doesn't just provide water but is a symbol of life, fertility and motherhood. She is always the provider, providing the basic capitals of humankind–the soil, water and air. Any diversion of the river is like blocking the nerve of Mother Earth.

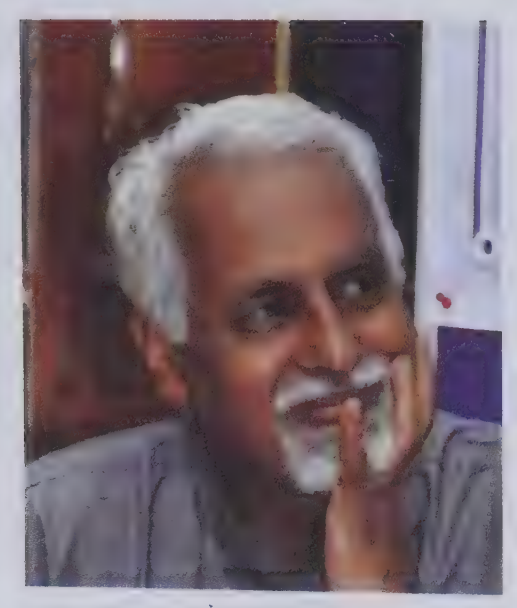
This not only leads to ecological destruction but as the report has shown it will be a disaster for those who live in the region that has most evolved agricultural systems in the foothills of Western Ghats. At macro level it poses a serious threat of increased desertification and waterlogging in the Deccan plains.

The report provides an in-depth analysis of how the disaster will unfold with short and long term consequences that would eventually destroy the fragile localecology of Western Ghats, upsetting the wildlife habitats and decimating the green cover that acts as buffer; mitigating the impact of climate change.

This report exposes the false assumptions made by the government to divert Bhandura Nala that is solely driven by political and financial interest. The objective is to reap political and economic profit at the cost of sacrificing the natural ecosystems.

By providing credible alternatives this report has given an opportunity to the political parties to choose a sane, sustainable and practical alternative that helps to regenerate the natural ecosystems as well as secures the livelihood of local communities.

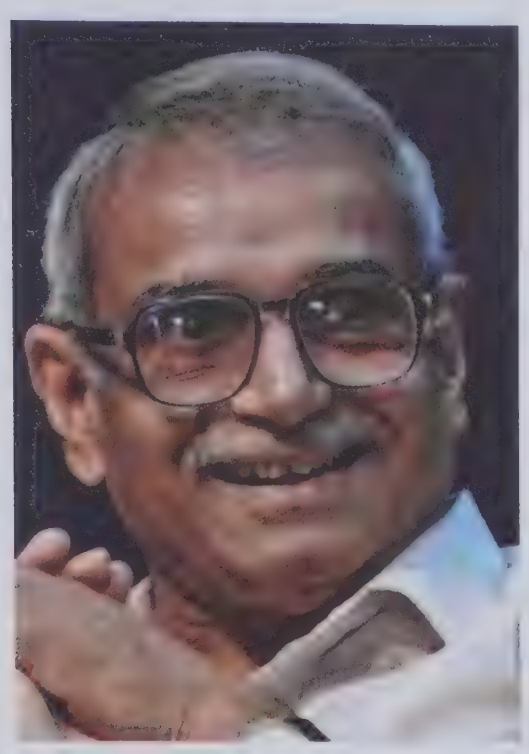
Let us hope this report reaches those who make decisions and have the power to avert the impending disaster.



Dr. Sanjeev Kulkarni
Dharwad

Obstetrician & Gynaecologist
Connoisseur of Kannada art and culture
Organic farmer, Writer
Founder, Baala Balaga Shale
Vice President, Karnataka Vidya Vardhaka Sangha, Dharwad
President, Gandhi Shanti Prathisthan, Dharwad

"ಉತ್ತರ ಕರ್ನಾಟಕ ಉಳಿಸಿ ನಾಗರಿಕರ ವೇದಿಕೆಯವರು ತಯಾರಿಸಿರುವ ಭಂಡುರಾ ನಾಲಾ ಪ್ರಾಜೆಕ್ಟ್ ವರದಿಯನ್ನು ನಾನು ಓದಿದ್ದಿದ್ದೇನೆ.ಈ ವರದಿಯು ಸಮಗ್ರವಾಗಿದೆ, ವೈಜ್ಞಾನಿಕವಾಗಿದೆ ಹಾಗೂ ಸಮಯೋಚಿತವಾಗಿದೆ. ಈ ಭಂಡುರಾ ನಾಲಾ ಅಥವಾ ಮಹದಾಯಿ ತಿರುವು ಯೋಜನೆ ಹಲವು ದಶಕಗಳಿಂದ ನೆನೆಗುದಿಗೆ ಬಿದ್ದ ವಿಷಯವಾಗಿದೆ.ಹಾಗೂ ಅದೇ ಕಾರಣಕ್ಕೆ ಬಹಳ ಸೂಕ್ಷ್ಮ ವಿಷಯವೂ ಆಗಿದೆ.ಈ ವರದಿಯು ಈ ಯೋಜನೆಯಲ್ಲಿ ಅಡಕವಾಗಿರುವ ಎಲ್ಲಾ ಸಂಗತಿಗಳನ್ನು ಅತ್ಯಂತ ತಾರ್ಕಿಕವಾಗಿ ವಿಶ್ಲೇಷಣೆ ಮಾಡಿ ಮಹದಾಯಿ ಯೋಜನೆಯು ದೂರಗಾಮಿಯಾಗಿ ಪರಿಸರಕ್ಕೆ ಮತ್ತು ನಮ್ಮ ಜನಸಮುದಾಯಕ್ಕೆ ಹೇಗೆ ಸಹಾಯಕ ಆಗುವದಿಲ್ಲ ಎಂಬುದನ್ನು ಸ್ಪಷ್ಟವಾಗಿ ನಮ್ಮೆದುರು ತೆರೆದಿಡುತ್ತದೆ.ಎಲ್ಲ ಪ್ರಜ್ಞಾವಂತ ನಾಗರಿಕರು ಈ ವರದಿಯನ್ನು ಓದಿದರೆ ಮುಂದಿನ ದಿನಗಳಲ್ಲಿ ಒಂದು ಸರಿಯಾದ ಪರಿಸರಸ್ನೇಹಿ ಹಾಗೂ ಜನಪರ ನಿರ್ಣಯಕ್ಕೆ ಬರಲು ಅನುಕೂಲಕ್ಕೆ ಬರಲು ಸಾಧ್ಯವಾಗುತ್ತದೆ."



Nagesh Hegde
Bengaluru

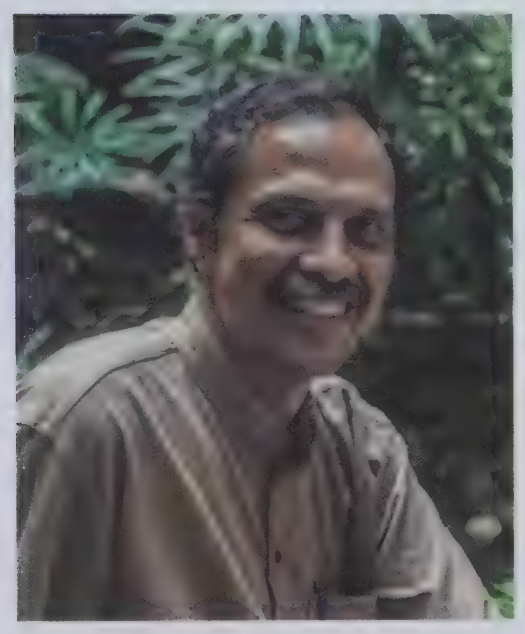
Senior Journalist and author

> "There is an urgent need to educate sugarcane farmers in the Malaprabha basin about the dangers of over-irrigating their fields...
>
> We are at a critical juncture where we can no longer afford the luxury of demand-driven projects."

This is an excellent, multidimensional report on the impact of the Bhandura Nala diversion project on the ecosystem of both the Western Ghats and the *maidan* region of northern Karnataka. The authors have rightly emphasized the importance of adhering to the precautionary principles before embarking on a project that could be ecologically and economically devastating to the region's natural balance.

There is an urgent need to educate sugarcane farmers in the Malaprabha basin about the dangers of over-irrigating their fields.

We are at a critical juncture where we can no longer afford the luxury of demand-driven projects. Both farmers and the general public must be made aware of the importance of conserving and recycling water. Our technological prowess should focus not on profligation but on efficiency.



Sharadchandra Lele
Bengaluru

Ph.D. (IISc) in Environmental Engineering
Environmental researcher and scholar
Extensive work at the intersection of ecology, economics and social justice Works in the Western Ghats Attached to ATREE (Bengaluru) and Foundation for Ecological Security, Anand, Gujarat

> "Spending more public money on a supply-side project to fix a water distribution and governance issue, with so much collateral environmental damage, is simply not acceptable."

The Kalasa and Bhandura Nala diversion projects are environmentally harmful. And from a water resource perspective, they are quite unnecessary, given the ongoing wasteful use of water for sugarcane cultivation in the Malaprabha basin. The fact that irrigation water does not reach the tail-end of the Malaprabha command has to do with the mismanagement of water both in the head reaches and in the catchment of the Malaprabha dam. Spending more public money on a supply-side project to fix a water distribution and governance issue, with so much collateral environmental damage, is simply not acceptable.

Akhilesh Chipli
Sagar

Journalist
Western Ghats Forests Activist

"ಸದರಿ ಯೋಜನೆಯು ವಿನಾಶಕಾರಿ ಯೋಜನೆಯಾಗಿದೆ."

ನಾನು ಅಖಿಲೇಶ್ ಚಿಪ್ಪಳಿ, ಪತ್ರಕರ್ತ ಮತ್ತು ಪರಿಸರ ಹೋರಾಟಗಾರ, ಸಾಗರ, ಶಿವಮೊಗ್ಗ ಜಿಲ್ಲೆ, ಬಂಡೂರ ನಾಲಾ ಯೋಜನೆ (ಮಹದಾಯಿ ನದಿ ತಿರುವು) ವರದಿ (ತಯಾರಿಸಿದವರು: ಬೆಳಗಾವಿ, ಹುಬ್ಬಳ್ಳಿ ಮತ್ತು ಧಾರವಾಡದ ಪ್ರಜ್ಞಾವಂತ ನಾಗತರಿರು) ಯನ್ನು ಸಂಪೂರ್ಣವಾಗಿ ಓದಿ, ಅರ್ಥ ಮಾಡಿಕೊಂಡಿದ್ದು, ಸದರಿ ಯೋಜನೆಯು ವಿನಾಶಕಾರಿ ಯೋಜನೆಯಾಗಿದೆ. ಸರ್ಕಾರ ಈ ಯೋಜನೆಯನ್ನು ಜಾರಿ ಮಾಡಿದಲ್ಲಿ ಪರಿಸರ, ಜೀವವೈವಿಧ್ಯ ಹಾಗೂ ವನ್ಯಜೀವಿಗಳಿಗೆ ಅಪಾರ ಹಾನಿಯಾಗಲಿದೆ. ಈ ವರದಿಯಲ್ಲಿ ಸಮರ್ಥವಾದ ಪರ್ಯಾಯಗಳಿವೆ ಎಂಬುದನ್ನು ಎತ್ತಿ ಹೇಳಲಾಗಿದೆ. ಉತ್ತರ ಕರ್ನಾಟಕದ ನೀರಿನ ಸಮಸ್ಯೆಗಳಿಗೆ ಪರ್ಯಾಯ ಮಾರ್ಗಗಳಿವೆ. ಆದ್ದರಿಂದ, ಸರ್ಕಾರ ಈ ಯೋಜನೆ ಜಾರಿಗೆ ಮುಂದಾಗಬಾರದು. ಈ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ನಾನು ಈ ವರದಿಯನ್ನು ಸಂಪೂರ್ಣವಾಗಿ ಅನುಮೋದಿಸುತ್ತೇನೆ ಮತ್ತು ಸರ್ಕಾರ ಈ ವರದಿಯನ್ನು ಪರಿಗಣಿಸಬೇಕು ಎಂದು ಈ ಮೂಲಕ ಒತ್ತಾಯಿಸುತ್ತೇನೆ.

Shankar Sharma
Sagara

Power & Climate Policy Analyst

"Our society and the concerned authorities can ignore such a comprehensive reports at our own peril."

This is a comprehensive report projecting a scary scenario of the desertification of North Karnataka, due to the unsubstantiated/ irrational policies of the successive governments.

This is probably the first of its kind of reports on the threats being faced by the fresh water resources in the country, pointing to a scary but credible scenario of the potential desertification of N. Karnataka.

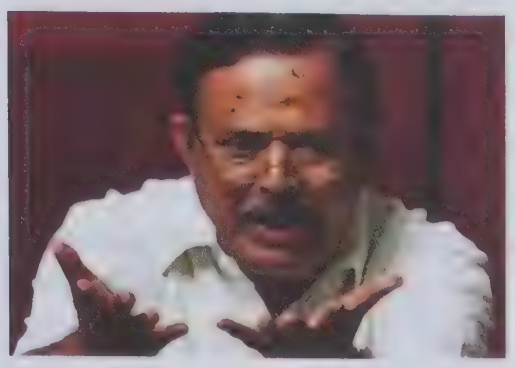
The Bhandura Nala Diversion Project, to divert water to Malaprabha River through inter-basin transfer, is viewed as threatening the very sanctity of the Bhimgad Wildlife Sanctuary.

Though the project is officially portrayed as a drinking water project, a few sections of the farmers in the region are reported to be keenly waiting for the project to meet their insatiable demand for commercial crops such as sugarcane.

This report has objectively tried to look into all aspects of the project proposal and has come to the unambiguous conclusion that the proposed project is neither in the interest of the locals, nor in the larger interest of the State, as a whole.

It is focused on presenting a set of credible suggestions/ recommendations to minimise the deleterious impacts from the project and/ or as credible alternative.

Our society and the concerned authorities can ignore such a comprehensive reports at our own peril.



A T Ramaswamy
Bislehalli, Hassan

President,
Parisarakkaagi Naavu
(People for Environment)

"...ಇಷ್ಟೆಲ್ಲ ಮಹತ್ವಗಳನ್ನು ಎಲ್ಲರೂ ಅರಿತು ಈ ವರದಿಯ ಆಶಯಗಳನ್ನು ಅರ್ಥ ಮಾಡಿಕೊಳ್ಳಬೇಕು. 'ಪರಿಸರಕ್ಕಾಗಿ ನಾವು' ಸಂಘಟನೆ ಪಶ್ಚಿಮ ಘಟ್ಟಗಳ ಪರಿಸರಕ್ಕೆ ಹಾನಿಯನ್ನುಂಟು ಮಾಡುವ ಎಲ್ಲಾ ಯೋಜನೆಗಳನ್ನು ವಿರೋಧಿಸುತ್ತದೆ ಮತ್ತು ಪಶ್ಚಿಮ ಘಟ್ಟಗಳ ಸಂರಕ್ಷಣೆಗೆ ಬದ್ಧವಾಗಿದೆ."

Save North Karnataka Citizens Alliance ಇವರು ತಯಾರಿಸಿರುವ ವರದಿ ಬಹು ಆಯಾಮಗಳ ಸಮಗ್ರ ವರದಿಯಾಗಿದ್ದು ಇದನ್ನು ಎಲ್ಲಾ ನಾಡಿನ ಹಿತ ಚಿಂತಕರು ಮತ್ತು ಪರಿಸರ ಕಾಳಜಿಯುಳ್ಳವರು ಗಂಭೀರವಾಗಿ ಪರಿಗಣಿಸಬೇಕಾಗಿದೆ.

ದಕ್ಷಿಣ ಭಾರತದ ಬಹುತೇಕ ಪ್ರಮುಖ ನದಿಗಳ ಉಗಮ ಸ್ಥಾನ ಪಶ್ಚಿಮ ಘಟ್ಟಗಳು. ಇವನ್ನು Water Tower of Southern India ಎಂದು ಕರೆಯಲಾಗುತ್ತದೆ. ಯುನೆಸ್ಕೋ ಪಶ್ಚಿಮ ಘಟ್ಟಗಳನ್ನು ವಿಶ್ವ ಪಾರಂಪರಿಕ ತಾಣಗಳ ಪಟ್ಟಿಯಲ್ಲಿ ಸೇರಿಸಿದೆ. ಜಗತ್ತಿನ ಕೆಲವು Biodiversity Hotspot ಗಳಲ್ಲಿ ಪಶ್ಚಿಮ ಘಟ್ಟಗಳು ಒಂದು. ದೇಶದ ಮಳೆ ಹಂಚಿಕೆಯಲ್ಲಿ, ಹವಾಗುಣ ಸಮತೋಲನ ಕಾಪಾಡುವಲ್ಲಿ ಈ ಪಶ್ಚಿಮ ಘಟ್ಟಗಳ ಪಾತ್ರ ಬಹಳ ದೊಡ್ಡದು.

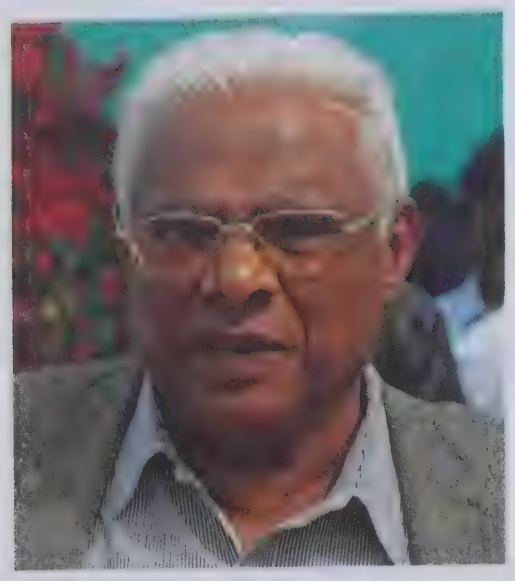
ಇಷ್ಟೆಲ್ಲ ಮಹತ್ವಗಳನ್ನು ಎಲ್ಲರೂ ಅರಿತು ಈ ವರದಿಯ ಆಶಯಗಳನ್ನು ಅರ್ಥ ಮಾಡಿಕೊಳ್ಳಬೇಕು. 'ಪರಿಸರಕ್ಕಾಗಿ ನಾವು' ಸಂಘಟನೆ ಪಶ್ಚಿಮ ಘಟ್ಟಗಳ ಪರಿಸರಕ್ಕೆ ಹಾನಿಯನ್ನುಂಟು ಮಾಡುವ ಎಲ್ಲಾ ಯೋಜನೆಗಳನ್ನು ವಿರೋಧಿಸುತ್ತದೆ ಮತ್ತು ಪಶ್ಚಿಮ ಘಟ್ಟಗಳ ಸಂರಕ್ಷಣೆಗೆ ಬದ್ಧವಾಗಿದೆ. ಪನಾಸಂ ಪರಿಸರ ಸ್ನೇಹಿ ಸುಸ್ಥಿರ ಅಭಿವೃದ್ಧಿ ಯೋಜನೆಗಳನ್ನು ಮಾತ್ರ ಬೆಂಬಲಿಸುತ್ತದೆ

Dr. Madhav Prabhu
Belagavi

President, Pyaas Foundation

"The present study on the desertification risks posed by the Bhandura Nala Diversion Project is commendable for its scientific rigour, legal precision, and comprehensive scope. It draws on authoritative government data, peer-reviewed research, statutory provisions, and field-level observations to present an unambiguous picture of the ecological, hydrological, and socio-economic dangers involved. By linking forest-rainfall feeback mechanisms, estuarine salinity dynamics, and cumulative project impacts, the study achieves a rare integration of climate science, biodiversity and conservation, Its use of the Yettinahole precedent as a cautionary is both methodologically sound and strategically effective."

Dr. Yellappa Reddy's considered views



Dr. A. N. Yellappa Reddy
Bengaluru

An appeal to create a space for Green Heart Governance

Experts from the agricultural community and reputed research institutions have involved voluntarily to prepare this report. It is inclined towards a Green Policy framework in its examination of the Bhandura Nala Project which is crucial for the sustainability and stability of the underground water sources, the riverine hydrology, and for prevention of salinity and alkalinity.

The report examines a wide range of issues which impact North Karnataka indicating the very survival and health of millions of people is at stake here. At the regional level there are clear signs of what may be referred to as *cancer symptoms*.

In my opinion Mother Earth is already suffering the consequences of several man-made ecological blunders. Governance is favoring sugar industry and sugarcane cultivators. Cultivators are growing sugar cane as a monoculture crop since decades leading to soil sterility. Alcohol and ethanol production is being prioritized. The trace elements (both micro and macro) are depleted.

Our elected members and engineers have utterly failed to possess green consciousness, when the health of Plant Earth should be the top priority. Inescapable ecological blunders blatantly inimical to the interest of the Millennium Development Goals agenda are being promoted.

The proponents of the project are interested in the welfare of the sugarcane cultivator and sugar industry despite the fact that Mother Earth is already suffering from *cancer.*

What is required today is Green Policy for sustainability of rainfed multi-cropping, poly –and permaculture in our agriculture. In my opinion, 90% of the population is highly vulnerable to the crimes which this project is going to commit and inflict.

Impacts of climate change, wet desertification and the proliferation of invasive weeds threaten normal life and livelihoods of the people of the region as the project will destroy the bio-diversity in the natural eco-systems.

The tragedy is that the government has not even thought of launching adaptive technologies to remedy the ecological blunders committed so far.

Mechanisms to build ecological resilience for food security and provide access to basic essentials have fallen far behind in priority in government policy.

Today floods, famines, heat waves, wild fires have become regular occurrences. The brutal exploitation of fossil water goes on by way of digging borewell after borewell. World Bank reports have shown that borewell water is contaminated with fluoride and other heavy metals.

Several High Courts, and espe- cially the Supreme Court has time and again emphasised that, man being the enlightened species is expected to act as trustee of Mother Earth.

On the contrary, we through our policy and practice are destroying land-scapes of river origins, when maintaining the rich bio-diversity of million year old eco systems is mandatory as trustees and keepers of Mother Earth.

The time has come for mankind to live sustainability and respect the rights of rivers, lakes, ponds, beaches, ridges as well as natural eco-systems. Surely and certainly man is bounded by the laws Mother Nature.

Mother Earth is not a lifeless object but a living entity with quality of high resilience. There is an urgent need to persist to regenerate the vital natural cycles of water, carbon, nitrogen by maintaining virgin forest eco-systems.

The very purpose of creating wildlife sanctuaries and national parks was to allow for such natural resilience systems to play their role. Only 3% to 4% of our forests enjoy this protective status. It is shocking to know that this too is being eliminated by the Bhandura Nala proposed project, mindlessly and cruelly.

The proposed project undoub- tedly will lead to accelerating the land degradation and desertification process in North Karnataka

Farmers and laborers usually become the soft targets of these ventures and projects, becoming victims of infertility, addictions, cancer, and serious health and social repercussions. Thousands of such cases came before us while conducting a quasi-judicial Lok Adalat at Gulbarga.

During my tenure as member of Lok Adalat, the feasibility of the Bhandura Nala project was deliberated upon. Lok Adalat had directed the Regional Commissioner and the Chief Engineer to submit a detailed report. But unfortunately, this report has been suppressed.

When all over the world, in developed countries, dams are being decommissioned to restore river courses, **interfering with the headwaters of Bhandura Nala by engaging in mindless, unsustainable diversion is clearly a misadventure.**

Since a decade, the Supreme Court and High Courts have very clearly and abundantly spelt out that sustainable development, conservation and protection of natural resources should take precedence. The WATER TOWERS (mountains and forests) of Bhimgad region, is what the citizens of Mahadayi Basin are pleading to preserve.

The economy of North Karnataka region is solely dependent on the health and wellbeing of the natural settings awarded to the region by way of the Western Ghats.

In the recent judgment on clearing of ancient trees and ecosystems, the Chief Justice of Supreme Court warned the Telangana Government not to mislead the Supreme Court. Going further to add that the Supreme Court will not hesitate to take serious action if require.

The tone and tenor of the judgement abundantly highlights the competing rights of the people as against securing the ecological integrity of the landscape. **Development v/s Environment balance has to be carefully managed to adopt homely, eco-centric approach which is not greed-centric.**

We should become confident in our sane and sensible approach which I have seen in abundance in the Bhandura Nala Report. The mountains of the Bhimgad region give rise to the streams, rivulets, rivers and their tributaries of the Mahadayi and the Malaprabha.

There is an urgent need to understand that we learn to live in harmony with the creation of the creator. **Today we are surrounded and encompassed by instances of ecological blunders and flouting of fundamental laws.**

Therefore, let us face reality honestly and learn to live safe-guarding Mother Nature as trustees and custodians and remember that we are children of Mother Earth.

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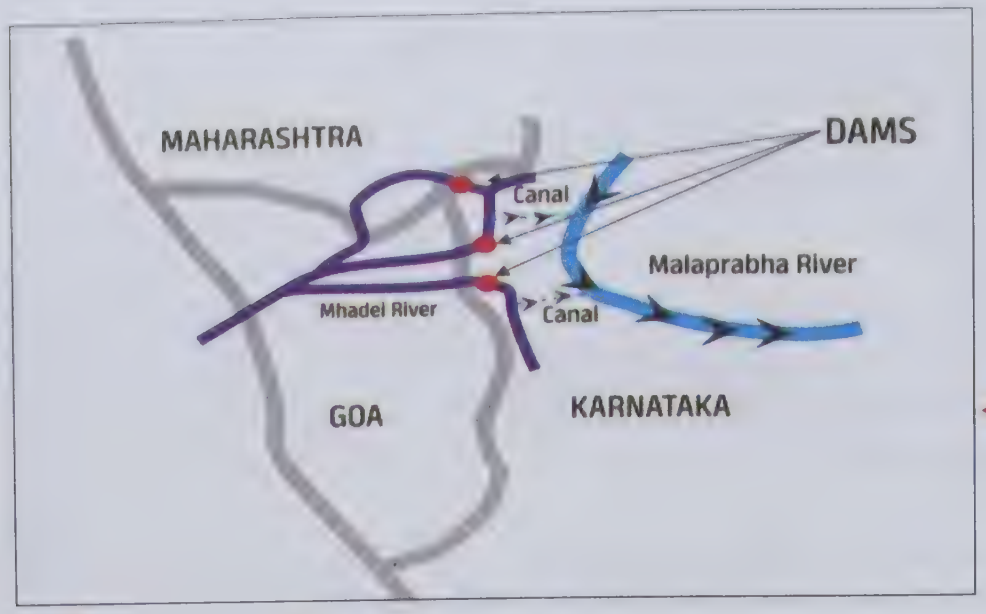
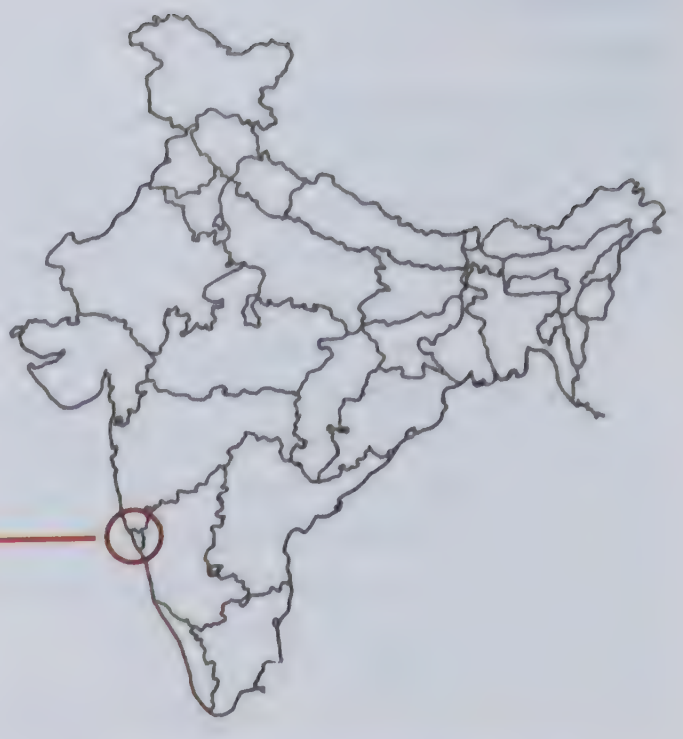
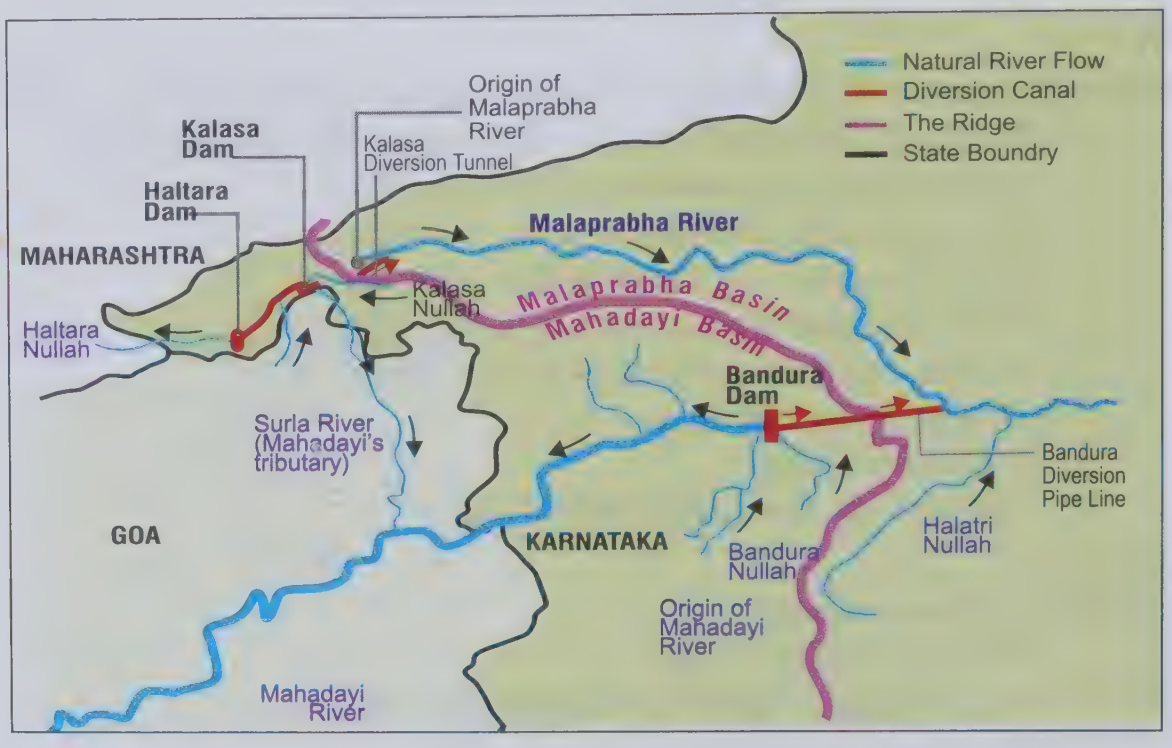
Location of Mahadayi Diversion Project

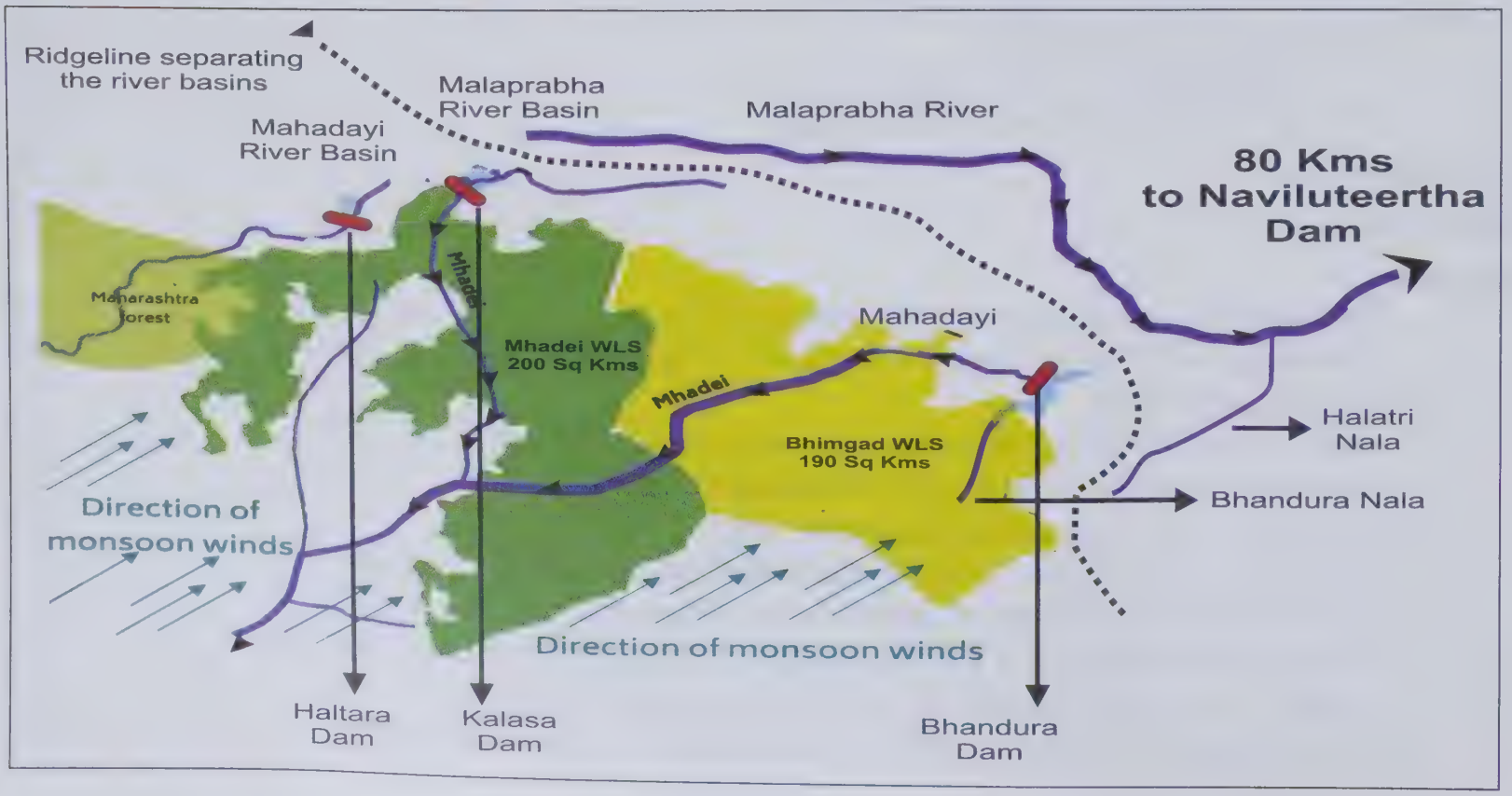




Location WRT State Boundaries & River Basins



Location WRT Wild Life Sanctuaries



Overview

This report is based on scientifically researched data and findings of national organisations such as, IISc - Bengaluru, IIT – Bombay, ISRO, IMD, MoEF&CC, ATREE, CEC, BARC (Punjab), SACON, WRI, KSNDMA; international organisations such as UNESCO, UNFCCC, COP and others; project reports and Government documents available on official websites, ground-level interactions with resident communities, newspaper reports, information obtained through RTI, and consultations with Government officials and elected representatives.

The synthesis of evidence presented here indicates that the proposed Bhandura Nala Diversion Project is likely to contravene several national environmental safeguards and overlook the substantial body of scientific understanding now available on sustainable water management. In its current form, the project design underestimates the ecological and hydrological sensitivity of the Western Ghats headwaters and therefore poses a high risk of long-term ecosystem degradation and downstream water insecurity.

It also fails to consider the extensive body of knowledge and practice currently available for meeting water needs, ignores the implications of the climate crisis, and disregards the ecological services rendered by forested areas in maintaining the delicate balance that sustains the monsoons of North Karnataka region.

Most critically, it heightens the looming risk of accelerated regional desertification, and overlooks the health and economic risks that will inevitably befall resident communities of the project area as well as the intended beneficiary populations of the Malaprabha Basin.

Summary of Facts, Research Findings and Recommendations:

1. Water awarded for diversion i.e., 2.18 TMC is at the cost of irreparable damage to forests and irreversible ecological losses
2. Desilting the Renukasagar Reservoir of the Malaprabha Dam alone, apart from several other options, will make available 6 TMC at a fraction of the cost of diversion.
3. Reclaiming and restoring the flow of Bennihalla will provide up-to 5 TMC of water, while adopting water efficient irrigation for sugarcane such as use of drip irrigation can save up-to 50 TMC of water

A careful examination of the constitutional provisions, statutory requirements, environmental realities, socio-cultural and livelihood practices, health and economic considerations indicate that the project, in the long term, is untenable.

1. The Kalasa Bhandura Nala Diversion Project

Since the mid-1980s, the change in land cover and land use and cropping and irrigation patterns in the Malaprabha catchment and basin have led to severe water stress in the downstream districts in North Karnataka. To offset this shortfall, there has been a demand for the diversion of water from the Mahadayi.

Officially known as the Kalasa-Bandura Diversion Project, the scheme's stated objective is to provide drinking water to the twin cities of Hubli-Dharwad and villages en-route. It encompasses diversion of water from the Bhandura Nala, a tributary of the Mahadayi River to the Malaprabha River.

The scheme was initially envisaged in the 1980s as a project for augmenting water for irrigation in the Malaprabha basin, where chronic water scarcity was already affecting agriculture. However, since it was perceived difficult to obtain the necessary permissions from statutory bodies under that head, it is projected as a drinking water scheme for ease of justifying it. Now the project includes the construction of a diversion dam, a jack well-cum-pump house and a pipeline to convey the water from the Mahadayi River to the Malaprabha River. The diversion site lies just 1.9 km outside Bhimgad Wildlife Sanctuary.

The project is a major point of contention between Karnataka, Goa, and Maharashtra states which share the Mahadayi river basin. As the river is Goa's lifeline, the dispute was taken to tribunals and courts, where they still remain unresolved.

After initial approval of the Project by the Centre, the State of Goa approached the Supreme Court in 2006. Subsequently in November, 2010 The Mahadayi Water Disputes Tribunal was formed to resolve the dispute. In 2018, MWDT awarded Karnataka 3.90 TMC of water for drinking purposes. This included 2.18 TMC from Bhandura Nala and 1.72 TMC from Kalasa Nala. This is 84% of the flow of the Bhandura Nala. This award was gazetted by the central government in 2020.

The Central Water Commission (CWC) gave its technical clearance to the modified Detailed Project Report (DPR) of the Bhandura and Kalasa lift schemes in December 2022, subject to compliance with all mandatory legal clearances from the National Board for Wildlife (NBWL) and the Ministry of Environment, Forest and Climate Change (MoEF&CC) of the Government of India. Goa has challenged this approval in the Supreme Court. The court has instructed Karnataka to obtain all necessary clearances before proceeding.

The Mahadayi PRAWAH (Progressive River Authority for Welfare and Harmony), established to implement the tribunal's award, was constituted in 2023. Despite CWC clearance, the project awaits final approval from the Central Government under the Forest Protection Act.

The National Board for Wildlife has deferred its decision on the Kalasa Nala project, and State authorities continue to seek clearance from the Ministry of Environment, Forest and Climate Change (MoEF&CC) for the Bhandura scheme. The Centre has put the project on hold, stalling the diversion of forest land.

At the time of preparing this report the status of the project is that the construction of Kalasa diversion underground canals at Kankumbi stands completed sans the necessary clearances. A factory to fabricate pipes for Bhandura Nala diversion has been set up at Nersa village. Land acquisition notices have been served to farmers for the Bhandura Diversion and the necessary procedures are in progress.

The project has faced opposition from environmental groups due to its impact on forest land, wildlife and the ecology of the Mahadayi river basin. Concerns were raised regarding potential impacts on the Bhimgad Wildlife Sanctuary in Karnataka and the Mhadei Wildlife Sanctuary in Goa as well as agriculture and livelihood of the population dependent on the Malaprabha basin. These are detailed in further sections.

2. The Project Site

The Western Ghats are a 1,600 km long mountain range running parallel to India's western coast, spanning six administrative states. It was recognized as UNESCO World Heritage Site in 2012 and is a global biodiversity hotspot. This mountainous

chain plays a crucial role in India's climate by influencing monsoon weather patterns. The Western Ghats are characterized by high biodiversity, with a significant proportion of India's plant and animal species, many of which are endemic to the region.

The two rivers at the focal point of the project—Mahadayi as well as Malaprabha—originate within a distance of about 5 kms from each other in the Western Ghats in Belagavi district of Karnataka state. The Mahadayi originates in the Bhimgad Wildlife Sanctuary and the Malaprabha originates in adjacent Kankumbi, both part of Khanapur Taluka. Malaprabha originates on the leeward side of the same mountain range as the Mahadayi. Malaprabha flows eastward to become a tributary of the Krishna River, while Mahadayi flows westward through the state of Goa as the river Mandovi before joining the Arabian Sea near Panaji.

The Bhandura, Kalasa and Haltara nalas are the main tributaries and headwater spring-streams of the River Mahadayi. The Halatri Nala, the main headwater spring-stream, and other tributaries of River Malaprabha run parallel to Bhandura and Kalasa Nalas. All of these lie in the same geographic region. All of these together create 80% of the monsoon water flow to River Malaprabha.

The Mahadayi and its tributaries flow through the three administrative states of Karnataka, Maharashtra and Goa. At Kankumbi, the Kalasa Nala enters Mhadei WLS within 1 km. The Bhandura Nala enters Bhimgad WLS within 2 Kms and flows for 25 kms in Bhimgad WLS and then enters the Mhadei WLS. The Mahadayi River enters the Goa state where it is known as the Mondovi.

The Bhimgad Wildlife Sanctuary (BWLS), admeasuring 190 sq km, has been classified as Eco-Sensitive Zone (ESZ 1) by the Gadgil Committee (WGEEP Report) and by scientists at IISc, Bengaluru. The Mahadayi River serves as a lifeline for the Bhimgad Wildlife Sanctuary of Karnataka, Mhadei Wildlife Sanctuary in Goa, and subsequently the marine flora and fauna. The area provides a multitude of wild habitats that is assisting in maintaining significant biodiversity. These have tiger presence and are an established tiger corridor linking the forests of Maharashtra-Karnataka-Goa as one contiguous stretch.

3. Western Ghats as Climate Buffer

Orographic Rainfall Enhancement: South West monsoon is the main source of rain for India, providing 75% of the annual rainfall. The Western Ghats act as a natural monsoon barrier and distribute rainfall, forcing the moisture-carrying southwest monsoon winds to rise. As the winds rise and cool, they release their moisture as heavy rainfall on the windward (western) side of the Ghats. This unique geomorphic feature significantly moderates the region's climate, influencing agricultural productivity and water supply for much of Southern India. Thus even during weak monsoons they produce rainfall in the region.

Moisture Recycling: The Western Ghats function as a regional moisture recycling system. Its forests transpire water vapour into the atmosphere, increasing local humidity and triggering convection. *Evapotranspiration* is a process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants. Trees play a vital role in the water cycle, releasing water vapour into the atmosphere through transpiration and helping rain water infiltrate the ground. **IISc studies demonstrate that Western Ghats forests contribute 25-40% of regional rainfall through evapotranspiration processes.**

Base-flow Maintenance: The Forested Ghats sustain river flows during dry periods, supporting downstream agriculture. They produce significant groundwater recharge through infiltration into porous laterite, basalt rock fractures and joints. This groundwater then slowly releases into streams and rivers, especially during the dry, pre-monsoon season, thereby maintaining perennial river flows and supporting vital ecosystems.

Buffer against El Niño Effects: The Western Ghats serve as a critical climate buffer during El Niño and drought years through multiple mechanisms. **El Niño events have a significant inverse relationship with Indian monsoon rainfall, with Karnataka experiencing negative rainfall anomalies during all El Niño years as has been shown by scientific research.**

This disruption, marked by warmer waters in the Pacific, occurs because the warming interferes with global air and cloud patterns. This weakens the Walker circulation which reduces the flow of moist winds towards India. Indian weather agencies closely monitor these ocean temperatures and pressure changes to forecast monsoon patterns and issue early warnings helping mitigate the risks to agriculture.

Bhandura Nala Diversion Site and BWLS

Many species that are endemic to the region and therefore of global conservation value are found in the Bhimgad Wildlife Sanctuary. BWLS shelters globally threatened species and provides roosting and breeding habitat for the Wroughton's Free-tailed Bat, a species with fewer than 200 individuals worldwide. The rare Western Ghats Tiger Beetle (Cicindela andrewesi), Black-headed Tiger Beetle (Cicindela fabriciana), the damselfly species, and the White Dartlet *Agriocnemis pieris* among other species are found here. *(Refer Annexure VIII)*

4. Flaws in the Bhandura Nala Diversion Project

Contradictory Assessments: The diversion is presented as a drinking water project for parts of North Karnataka. However, project proposal from another body of the Karnataka State, namely the KUIDC, for the supply of drinking water to the very same villages, notes that there is sufficient water in the Malaprabha reservoir to meet the same until the year 2041.

Claim of Excess Rain: The claim underlying the larger Kalasa–Bhandura diversion scheme is that there is 'excess' rain in ESZ-1 headwater catchments. The assumption that Bhandura's water represents 'excess' rainfall is scientifically weak and ecologically unsound. High precipitation in these headwaters sustains the hydrological balance that maintains groundwater recharge and downstream baseflows; classifying it as 'surplus' ignores the system's moisture-recycling function The high precipitation (~3500 mm/year) is crucial for recharging groundwater, supporting cloud regeneration and maintaining downstream base-flows during dry months. The region acts as a moisture pump. The high rainfall is not "surplus", but part of a finely balanced hydrological system.

Misguiding Justifications: Justifying the diversion of Bhandura Nala to meet drinking water needs 100 kms away by augmenting the Malaprabha Basin - a basin already exploited by over 137 TMC for sugarcane cultivation reflects a fundamental flaw in principle, genuineness of intent and practicality.

Ignoring Apt Options: Failing to consider safer, economical, eco-friendly, sustainable and viable alternatives before diverting the water from Bhandura Nala and causing

irreversible harm is a flaw that violates both the precautionary principle and duty of due diligence.

Supression of Facts: The deliberate suppression of vital facts — including the proximity of the diversion project to Bhimgad Wildlife Sanctuary and the diversion of the naturally flowing Bhandura Nala into the sanctuary — by Karnataka Niravari Nigam and various departments of the Karnataka Government, including the Forest Department and the Forest Ministry, in order to evade scrutiny under multiple State and Central environmental and forest regulations, constitutes a serious *flaw* in the integrity and bona fides of the project. This concealment, driven by *malafide intent* to push the project forward despite its grave ecological consequences, reflects a fundamental *flaw* in the genuineness of the claim that the project serves the public interest or the betterment of citizens."

Diversion of 84% of Water: The Central Water Commission (CWC) formalised the tribunal quota of 2.18 TMC and assigned only **0.4TMC (≈16%)** of dependable yield to ecological releases, well below the minimum nationally notified threshold. The Central Water Commission's environmental-flow norms per issued by the Ministry of Environment, Forest & Climate Change for river valley projects is 30% in the monsoon, 20% in the lean season, 25% in intermediate months at 90% dependency. Flows calculated at 90% dependency indicate that there will be **zero E-Flow** and a deficit of 0.8 TMC in the proposed quantum to be diverted.

Wrong choice of Site: The catchment sits in one of the wettest parts of the Ghats (>3,000 mm/yr) and still retains significant evergreen cover.

Heavy economic costs: The cost projection of KBD Project is ₹800-1000 crore for 2.1 TMC water, while other alternatives (listed below under section VIII) can cost way less.

5. Undesirable Effects of the Diversion Project

Long-term Ecosystem Damage Trajectory

Evidence from scientific studies shows that stream diversions in forested headwater catchments have cascading effects on forest structure, forest degradation, water cycles, desertification, microclimate, and species composition leading to social and economic disruption.

To start with reduction in the perennial water source to the densely wooded BWS due to KBD will lead to reduction in forest cover. Documentation demonstrates correlations between Western Ghats forest degradation and regional ecological destabilization.

The disruption of Western Ghats moisture recycling through projects such as the Bhandura Diversion will accelerate desertification through:

Disruption of Water Cycles

Reduced Evapotranspiration: Research on forest-rainfall feedback loops confirms that **reduced forest cover** leads to diminished evapotranspiration, decreased cloud formation and reduced precipitation, making the land drier and disrupting rainfall patterns. Studies in comparable Western Ghats areas show that **rainfall declined up to 30% in areas where evergreen forest was replaced with plantations or cleared**. **These self-reinforcing feedbacks may drive semi-arid regions toward ecological thresholds that are difficult to reverse.**

Increased Flooding and Landslides: The disruption of water cycles, combined with increased soil erosion, can lead to more extreme weather events such as floods and landslides.

Rainfall Reduction Mechanisms

The scientific mechanism underlying rainfall reduction involves multiple factors:

Disrupted Orographic Effects: Forest degradation makes slopes hotter and drier, disrupting the mechanism of moisture capture and recycling through orographic uplift by Western Ghats

Loss of Cloud Condensation Nuclei: Forests release volatile organic compounds that act as cloud condensation nuclei. Degraded forests emit fewer compounds, resulting in reduced cloud formation and rainfall.

Weakened monsoon stability: Studies show that forest degradation in central Western Ghats reduces monsoon resilience and delays onset. **During El Niño events this can trigger regional-scale rainfall decline and desertification across Karnataka's rain-fed zones**.

Historical Evidence: Analysis of meteorological data shows that over the past seven decades, El Niño weather patterns occurred 15 times, with India experiencing drought conditions in the majority of cases. In Karnataka specifically, **El Niño events are associated with 15-20% below-normal rainfall** in interior and northern districts. **Degradation of this buffering capacity** through projects like KBD creates compound climate risks through peninsular India.

Reduced baseflow will result in less inflow into east-flowing Malaprabha and its tributaries causing d**ecreased groundwater recharge** in drought-prone districts like Bagalkot, Koppal and Vijayapura effectively undermining the very water-security objectives of the diversion.

Cascading Effects

Hydrological regime shifts: Perennial streams become seasonal, affecting downstream water security.

Agricultural system collapse: Rain-fed farming becomes unviable as rainfall patterns destabilize.

Reduced Water Quality: Forests filter water and maintain water quality. Diversion of water sources can reduce forest cover leading to increased run-off.

Increased temperature extremes: Forest loss leads to higher surface temperatures and intensified heat waves, **leading to** longer dry spells will result in semi-arid regions and semi-arid regions.

Irreversible loss of endemic species: Fragmentation and habitat drying will lead to local extinctions.

Effects on Forest Structure

Satellite analysis by the Indian Institute of Science shows that Uttara Kannada district's forest area located south of Bhimgad WLS has fallen from 74.19% in 1973 to 48.04% in 2018, with evergreen forest declining from 56.07% to 24.85% over the same period. Karnataka's Western Ghats have lost 58.22 square kilometres of forest cover in the decade from 2013-2023. Four of Karnataka's ten Western Ghats districts have experienced severe forest cover loss, with Shivamogga losing 74.5 sq km and Belagavi losing 24.9 sq km.

This, over a 45 years period, represents a **26.15 percentage point decline in total forest cover** and a **31.22 percentage point decline in evergreen forest cover**. The

Mahadayi Diversion Project directly threatens about 500 sq km of protected forests which could add to the above with devastating consequences. Clear correlations have been established between Western Ghats forest degradation and regional climate destabilization.

Empirical Evidence: Research using satellite data and ground measurements shows that **dense forest areas (intact contiguous forests) in the northern, central and southern Western Ghats have considerably decreased by 2.84%, 4.38% and 5.77% respectively,** with corresponding impacts on local temperature and rainfall patterns.

Soil Erosion and Degradation: Tree roots stabilize soil, and their removal makes the soil loose and prone to erosion. This degraded soil can lead to reduced agricultural productivity and can contribute to landslides.

The desertification implications: These represent the most alarming long-term consequence of the proposed diversion. According to ISRO's 2021 *Desertification and Land Degradation Atlas*, Karnataka already ranks fifth nationally under 'significant land degradation' with 6.96 million hectares (36.29% of the state's geographical area) degraded land, representing 7.11% of India's total degraded land. The scientific mechanism underlying desertification risk involves disruption of forest-rainfall feedback loops, where reduced forest cover leads to diminished evapotranspiration, decreased cloud formation, and ***further forest degradation in self-reinforcing cycles that can push semi-arid regions into irreversible ecological decline.***

Beyond direct impacts of forest loss, the KBD poses an insidious threat of desertification by *altering downstream estuarine salinity.* Laboratory experiments by Obianyo (2019) demonstrated that increasing salinity—specifically sodium chloride (NaCl)—retards evaporation by approximately 28.8% compared with freshwater, slowing the hydrological loop and reducing atmospheric moisture content needed for cloud formation. The Mahadayi River's freshwater discharges into Goa's Mandovi and Zuari estuaries are crucial for preventing saline intrusion from the Arabian Sea and sustaining brackish-water ecosystems. KBD would raise estuarine salinity, thereby lowering surface evaporation rates and coastal humidity. Ironically, this reduction in regional evaporation can weaken monsoonal convection over the Western Ghats—already a pivotal moisture source for North Karnataka's rain-fed agriculture—leading to diminished recharge in the Malaprabha and Krishna tributaries.

S. Vishwanathan's study provides **scientific validation** that altering the salinity dynamics of river systems has **far-reaching consequences** on the hydrological cycle. Thus, the diversion of Mahadayi water must be reconsidered not just for its legal or ecological consequences, but for the regional climate destabilization and desertification it would hasten, especially in North Karnataka.

Climate Change Amplifications

The project increases regional vulnerability to climate change by reducing the landscape's adaptive capacity to temperature extremes. Forests act as "carbon sinks," absorbing vast amounts of carbon dioxide from the atmosphere. Deforestation releases this stored carbon and reduces the planet's capacity to absorb more CO2, accelerating global warming, thus weakening the region's resilience to extreme weather events.

Biodiversity Loss, Habitat Fragmentation and Species-specific impact

Forests are home to a vast array of plants and animals, providing them with essential habitats. The diversion of water will create immediate microhabitat disruption leading to the loss of habitats and fragmentation of ecosystems which can drive species to endangerment or extinction. The project overlaps with the hydrological catchment that maintains the microclimatic stability of the Barapede caves, which host the only known breeding colony of Wroughton's Free-tailed Bat. Even marginal changes to cave humidity or perennial flow could jeopardize this fragile habitat, underscoring the need for rigorous site-specific impact assessment.

Downstream dependency: The Malaprabha reservoir already suffers chronic inflow deficits. Policymakers view the Bhandura diversion as a quick upstream fix. Yet independent audits of a similar precedent, the Yettinahole diversion (on River Netravathi), designed with a comparable methodology, without independent verification of hydrological assumptions, demonstrate that actual yield was only 9.55 TMC against a projected 24 TMC, leaving almost no exportable surplus with local water needs requiring 5.84 TMC and ecological flows demanding 2.84 TMC. This left minimal surplus for the intended diversions, causing significant ecological damage to Western Ghats forests without delivering the promised water security benefits Public investments, reportedly ₹23,251 crore (with 'Effects' noting over ₹17,147 crore spent on pipelines, pump houses, and storage tanks), have resulted in "dry pipes" or "dead-end taps" with no water to fill them in the supposed beneficiary districts like Chikkaballapur and Kolar. These "water-starved regions remain water-starved" despite the project. Another 8,000 crore is required to complete the project.

Beyond fiscal and hydrological failures, the Yettinahole project has caused significant ecological damage to the Western Ghats. It involved cutting through eco-sensitive areas (Western Ghats ESZ-1), removing hundreds of acres of forests for canals, roads, pump stations, and power lines. This deforestation has fragmented habitats, disrupted wildlife corridors (notably for elephants), and heightened landslide and human-wildlife conflict risks. *The project was controversially framed as a "drinking water" scheme to bypass mandatory Environmental Impact Assessment (EIA) and forest clearance laws, despite involving substantial non-drinking uses.*

Prof. T.V. Ramachandra of IISc has succinctly pointed out that

'The Yettinahole Project is a classic case of politically-driven engineering without an ecological sense. It fails the local ecology and fails the thirsty people it claims to serve."

This precedent underscores the severe fiscal and ecological risks of proceeding with large-scale diversions without independent verification of hydrological assumptions and robust environmental oversight, *further reinforcing the argument against the Bhandura Nala diversion.*

Another Yettinahole in the Making: Similar to Yettinahole, the Bhandura diversion is framed as a drinking water scheme to bypass mandatory environmental impact assessment (EIA) and forest clearance. This is in spite of being aware of the fact that the diverted water will be augmented into the basin waters which is already using 137 TMC for sugarcane cultivation.

The precautionary principle should have been used as the project comes with the risk of irreversible damage and will have similar results to the Yettinahole Debacle. As per precautionary principle, the flows should have been calculated on the basis of 90% dependability as mandated in the MoEF&CC and CWC guidelines.

While giving technical approval to the project, CWC should have evaluated above facts and should have weighed other alternatives and technical solutions as options. *(Refer Page 49)*

Cumulative regional scale ecological pressures: The impacts of diversion cannot be assessed in isolation. Its implementation occurs within a broader context of cumulative regional ecological pressures on the protected forests, including the parallel Kalasa diversion, the proposed Kotni hydroelectric project, the double laning of railway tracks, laying of high tension power lines, expansion of interstate highways etc. These combined infrastructure interventions risk breaching regional ecological thresholds, potentially triggering what environmental scientists describe as

"irreversible damage and cumulative effects that will push North Karnataka desertification as a runaway train."

6. Social and Economic Effects, Affected Populations and Livelihoods

Impact on Local Communities: Local communities depend directly on forests for their food, water, shelter and overall way of life. Deforestation can displace these communities and threaten their cultural heritage and traditions.

Khanapur Region Displacement: The project has already initiated land acquisition processes affecting multiple villages in Khanapur Taluka. Environmental activist reports confirm that, farmers and residents of Asoga, Nersa, Manturga, Rumewadi, Karambal, all villages of the Khanapur taluka where the project is planned, have received notices for land acquisition. A unit for the manufacture of large underwater pipes has already been set up. Community consultations indicate that local farmers perceive limited direct benefit from the project, coupled with significant concerns over forest loss and land acquisition impacts in Khanapur taluka.

Loss of Resources: The destruction of forests means the loss of valuable resources such as timber, medicinal plants and non-timber forest products, which can impact local and global economies.

Western Ghats Economic Value: Comprehensive economic studies of Western Ghats ecosystem services reveal substantial economic values at risk. Research shows that **ecosystem services from 10 square kilometres of Western Ghats forests are worth over ₹ 23 million** annually. The Mahadayi Diversion Project threatens to degrade 500 sq kms of forests.

Agricultural Economic Losses: Reduced rainfall and degraded water availability in areas like Dharwad-Bailhongal-Nargund-Ron will lead to "crop failures, economic losses" and "increased out-migration." Regional studies confirm that **areas with access to irrigation witnessed higher crop yields, increased cropping intensity, and diversification into high-value crops**.

Over 200,000 hectares in the Malaprabha basin are under traditional, rain-fed crops such as jowar, pulses and oilseeds. Any reduction in rainfall from the Bhandura diversion, especially in Khanapur Taluka (which contributes ~80% of inflow to Renukasagar), will directly translate into crop failures, soil moisture stress and worsening indebtedness for smallholders.

7. Case of the Malaprabha Basin and Sugarcane Impact

Malaprabha Basin Dependencies: The NIVA report reveals that **80% of stream flow and groundwater recharge in the Malaprabha catchment occurs from Zone 1**, the high-rainfall Western Ghats region where Bhimgad Wildlife Sanctuary is located. This

hydrological dependency creates cascading livelihood impacts across multiple districts.

The Malaprabha basin faces an acute water crisis exacerbated by unsustainable sugarcane cultivation which consumes 137 TMC annually against the basin's usable water availability of merely 48 TMC from 322 TMC of total rainfall. The basin's 11,549 sq km area receives 322 TMC of annual rainfall but only 15-20% becomes usable surface water due to high evapotranspiration and runoff losses. Against this limited supply of 48 TMC, total sectoral demand reaches 145-180 TMC, with sugarcane cultivation alone consuming 137 TMC across 86000 hectares, while other irrigated crops require 15-20 TMC, drinking water needs 5-6 TMC, and industrial use accounts for 4-5 TMC. This creates a staggering deficit of About 90 TMC, compensated through unsustainable groundwater overdraft. The crisis is most acute in tail-end areas like Ron and Nargund, located at the far end of the Malaprabha Left Bank Canal system, where upstream sugarcane cultivation monopolizes canal water, forcing these drought-prone regions to depend on failing borewells leading to aquifer collapse.

Sugarcane monoculture across over 86,000 hectares has triggered "wet desertification," characterized by waterlogging, salinization, reduced moisture recycling, and declining rainfall patterns. Areas like Ron and Nargund have experienced rainfall decline from 650mm to 500mm and 600mm to 450mm respectively, while Nargund declined from 620mm to 470mm. The intensive monoculture has created conditions similar to Punjab's Malwa belt, where groundwater depletion concentrates nitrates, fluoride and heavy metals to carcinogenic levels, while excessive pesticide use in waterlogged and salinized soils compounds cancer risks through contaminated drinking water and food chains. Scientific mechanisms linking wet desertification to cancer include nitrate concentrations exceeding 45 mg/L in groundwater, excessive use of probable carcinogens like glyphosate and anaerobic microbial conditions in saline soils that enhance toxicity.

Farmer Economic Dependencies: Research conducted in the Malaprabha basin demonstrates farmers' significant economic reliance on irrigation water. However, upstream diversions threaten this dependency structure.

Downstream Agricultural Impacts: The proposed project affects **2,35,000 hectares under Malaprabha irrigation**, with documented evidence showing that, "the Malaprabha reservoir already fails to meet promised 135-day irrigation releases in 3 out of 5 years." The document notes that,

"Adding new demand without augmenting inflow shifts scarcity, it does not solve it."

Irreversible Changes

Scientific consensus indicates that large-scale forest degradation combined with climate change can trigger permanent shifts in regional climate systems, potentially transforming moist tropical ecosystems into dry deciduous or scrub habitats.

The socio-economic analysis demonstrates that the Bhandura Nala diversion project represents far more than a technical water transfer scheme—it embodies fundamental conflicts over development models, environmental sustainability, and social equity that require comprehensive policy solutions addressing both immediate livelihood needs and long-term ecological resilience across the entire Western Ghats.

8. Statutory Provisions and Violations by the Project

The Western Ghats Site carries important international conservation obligations which this project implementation, without mandatory clearances, directly violates. The project's legal framework reveals multiple statutory violations that render it non-compliant with existing environmental protection laws. *Under Section 29 of the Wildlife Protection Act 1972, any diversion of water flow from, or within proximity to, protected areas requires explicit approval of the area's* Chief Wildlife Warden. The proposed diversion weir is located merely 1.9 kilometres from Bhimgad Wildlife Sanctuary with the stream originating within sanctuary boundaries.

The proposed Bhandura Nala diversion project falls within a constitutional framework that establishes clear environmental protection obligations. Article 48A of the Constitution, inserted through the 42nd Amendment in 1976, mandates that *"The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country."* While classified as a Directive Principle of State Policy, Article 48A provides the constitutional foundation for environmental legislation and has been interpreted by the Supreme Court as integral to fundamental rights.

Article 51A (g), introduced in 1976, establishes the fundamental duty of every citizen "to protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures." These provisions collectively establish both state and citizen obligations for environmental protection that are directly relevant to the Bhandura Nala project.

The most egregious violation involves Section 29 of the Wildlife (Protection) Act, 1972, which explicitly prohibits any person from destroying, exploiting, or removing any wildlife from a sanctuary, or destroying, damaging, or diverting the habitat of any wild animal by any act whatsoever, or diverting, stopping, or enhancing the flow of water into or outside the sanctuary, except under and in accordance with a permit granted by the Chief Wildlife Warden (in consultation with The National Board for Wildlife) and only if any such flow of water into or outside the Sanctuary is necessary for improvement and better management of Wildlife therein.

Legal compliance risks: Section 29 of the Wildlife Protection Act (1972) prohibits any alteration of water flow affecting a sanctuary, without proper clearances. The proposed diversion currently proceeds without that approval and with incorrect distance declarations in its forest-clearance filing.

The proposed project violates the **EIA Notification 2006**, which mandates environmental impact assessments for projects within 10 kilometres of protected areas like wildlife sanctuaries. According to the **Ministry of Environment, Forest and Climate Change, office memorandum dated August 8, 2019**, "prior clearance from Standing Committee of the National Board for Wildlife (SCNBWL) is mandatory" for developmental projects located within 10 km of National Parks/Wildlife Sanctuaries.

Compliance with India's environmental and wildlife protection statutes such as approval from the Standing Committee of the National Board for Wildlife under Section 29 of the Wildlife (Protection) Act, 1972, Environmental Impact Assessment, Central Water Commission guidelines and all other mandated clearances as per law are necessary prior to commissioning the project.

Critical compliance failures identified

Publicly available filings on the Parivesh portal under case FP/KA/WATER/460216/2024 contain discrepancies regarding sanctuary proximity declarations.

These require independent verification to ensure full compliance with the Wildlife Protection Act and related regulations.

The CWC-approved DPR incorrectly states that "EIA is not applicable." Hence, no comprehensive Environmental Impact Assessment has been conducted despite mandatory requirements.

Environmental Impact Assessment

The Bhandura Nala Diversion project represents a critical environmental assessment case study that demonstrates the interconnected nature of Western Ghats ecosystems and their role in regional climate stability. Scientific evidence from multiple peer-reviewed studies, government datasets and environmental assessments confirms that the project's environmental impacts extend far beyond the immediate diversion site, with implications for forest cover, rainfall patterns, desertification trends and climate resilience across peninsular India. This assessment synthesises current environmental conditions with predicted impacts based on documented precedents and scientific modelling.

The Bhandura Nala diversion fundamentally contradicts the principles of India's Jal Jeevan Mission (JJM) which emphasises decentralised, sustainable and community-based water solutions with source sustainability. While JJM promotes local aquifer management, rainwater harvesting and village-level interventions targeting rural households, the Mahadayi diversion represents a high-cost, ecologically damaging inter-basin transfer primarily benefiting urban centres like Hubli-Dharwad.

Government officials now face **critical policy decisions** as they weigh short-term water supply objectives against long-term environmental sustainability and legal compliance. The scientific evidence demonstrates that the project design presents unacceptable risks to biodiversity conservation and regional ecological stability, while violating multiple statutory frameworks designed to protect critical ecological assets. The choice before decision-makers involves either pursuing legally compliant, scientifically sound water management that protects natural heritage, or risking accelerated regional desertification through continued violation of environmental laws.

Additionally, the **National Green Tribunal in OA 498/2015** has directed all states to maintain a **minimum environmental flow of 15-20% of the average lean season flow** in their rivers.

9. Sustainable Policy Alternatives

However, the objectives of the KBD Project can be met without the damaging effects by undertaking several means and measures available.

Policy Alternatives for Mitigation and Prevention of Environmental Impacts

The following policy alternatives draw on verified government programmes and peer-reviewed studies to reduce pressure on the Western Ghats, curb desertification in North Karnataka and provide sustainable water security without large inter-basin diversions.

Scale up Micro-Irrigation under NMMI

Building on Karnataka's early adoption, micro-irrigation saved 30–69% of water and reduced energy use by 20–50% on 418,000 ha during 2006–07 to 2010–11 under the Centrally Sponsored Micro Irrigation Scheme. By increasing subsidy to 90% for smallholders (<5 ha) in Malaprabha command talukas (Bagalkot, Belagavi) and

operationalising the proposed Karnataka Antaraganga Micro Irrigation Corporation (KAMIC), surface-water demand for irrigation can be cut by up to 1.2 TMC annually.

Community-Led Check-Dam and Percolation Tank Restoration

Structures built under Jal Jeevan Mission and Atal Bhujal Yojana increased recharge through water-conservation structures from 0.63 BCM to 0.81 BCM in 2024—a 28.6% rise, despite delayed monsoon onset. Targeted reconstruction of 200 check-dams and 500 percolation tanks in Khanapur, Bagalkot and Koppal following CGWB norms (20 l/m² roof catchment, 10 l/m² land) will bolster base-flow in feeder streams, raise non-monsoon flows and stabilise downstream ecosystems.

Mandatory Rainwater Harvesting State-wide

The Bangalore Water Supply and Sewerage (Amendment) Act 2011 mandates rooftop harvesting for buildings >1,200 sq ft (existing) and >2,325 sq ft (new). Extending this requirement to all institutional and commercial premises >500 m² in Malaprabha command, with 100% subsidy for community structures and enforcement via Panchayats, can capture an additional 100 m³ per 1,000 m² annually, reducing runoff losses and enhancing aquifer recharge.

Watershed Restoration through Jal Shakti Abhiyan

Jal Shakti Abhiyan Phases I and II (2019) implemented 2.73 lakh water-conservation and rain-water harvesting interventions and renovated 44,497 water bodies. Allocating 5% of the Bhandura project cost (~₹270 crore) to revive 5,000 ha of degraded headwater forest in Bhimgad ESZ-1 under CAMPA, with technical monitoring by IISc and ATREE, will reverse forest cover decline (now 48% total, 25% evergreen in Uttara Kannada), strengthen monsoon resilience and mitigate wildfire risk.

10. Revival of Traditional Tank Networks under MGNREGA

North Karnataka's historic tank cascades once recharged aquifers and supported 60% of dry-season irrigation. Deepening and de-silting 1,000 tanks in Bagalkot, Koppal and Dharwad under MGNREGA, with community management, will restore local percolation systems, diversify water sources, and reduce reliance on inter-basin transfers.

Sustainable Alternatives for Water Security

Rather than pursuing the ecologically destructive diversion of Bhandura, Karnataka should prioritise proven alternatives that offer superior cost-benefit ratios and environmental sustainability. Desilting the Naviluteertha Dam can recover 5-6 TMC at ₹50-100 crore compared to the diversion's 2.18 TMC at ₹800-1000 crore, offering nearly three times more water at a tenth of the cost with positive ecological impacts including improved groundwater recharge and soil fertility through silt reuse. Harnessing local streams like Bennihalla can provide 2-3 TMC through decentralised check dams, farm ponds and tanks at ₹100-150 crore without interstate conflicts or ecological damage, keeping water within the Malaprabha catchment and aligning with natural hydrology.

Critical interventions include promoting water-efficient sugarcane plantations that require 50-60% less water (saving 60-80 TMC), and implementing comprehensive groundwater recharge programmes. These measures address the root causes of water scarcity while preserving the Western Ghats' ecological integrity essential for regional climate stability.

11. Inferences

The inferences drawn from this exercise point to the conclusion that the proposed Kalasa Banduri Diversion Project violates national environmental laws such as Wildlife Protection Act, 1972, Forest Conservation Act,1980, Environment Protection Act,1986 and its amendments, as well as India's global commitments on environment, SDG goals, carbon capping and sustainability.

It also fails to consider the extensive body of knowledge and practice now available for meeting water needs, ignores the implications of the climate crisis, and disregards the ecological services rendered by forested areas in maintaining the delicate balance that sustains the monsoons of North Karnataka region.

Most critically, it heightens the looming risk of accelerated regional desertification and overlooks the health and economic risks that will inevitably befall resident communities of the project area as well as the intended beneficiary populations of the Malaprabha Basin.

The analysis strongly points towards rejecting the Bhandura Diversion Project in favour of sustainable, locally-sourced water management strategies that align with national environmental policies and address the underlying causes of water scarcity in North Karnataka. The focus should shift from supply-side interventions to demand-side management, ecosystem restoration and community-based local water security solutions that enhance rather than compromise long-term regional resilience. The evidence demonstrates that local alternatives can provide significantly more water at lower costs while avoiding the ecological destruction and health risks associated with continued sugarcane monoculture expansion and inter-basin water transfers. Given the ecological sensitivity of the Western Ghats headwaters and the uncertainties in long-term hydrological response, it is prudent to invoke the precautionary principle before any irreversible interventions are undertaken.

The Bhandura diversion proposal exemplifies the difficult intersection of development planning, environmental stewardship and regional sustainability. Its review should therefore prioritize ecosystem-based water security solutions - measures that reconcile livelihood needs with long-term ecological stability. As this assessment has shown, the project's current design not only violates key legal and regulatory safeguards but also poses long-term risks to the ecological integrity of the Western Ghats—a globally recognised biodiversity hotspot—while undermining the hydrological stability that supports both local ecosystems and human communities.

Scientific and governmental analyses underscore the indispensable role of the Western Ghats' in maintaining regional rainfall patterns, groundwater recharge and climate moderation across peninsular India. The trend of declining forest cover in Uttara Kannada and adjacent districts, driven by interventions like the Bhandura diversion, has already been linked to measurable declines in annual rainfall, stream-flow, and soil moisture. The cumulative effects are particularly worrisome for North Karnataka, a region historically prone to semi-arid conditions and now shown—by ISRO's Desertification Atlas—to be among India's most vulnerable to advancing land degradation.

Desertification here is not a distant or abstract threat. With 6.96 million hectares of Karnataka already degraded and early warning signs evident in agricultural productivity, water table declines, and rural out-migration, any further disruption of the Western Ghats' ecosystem services could irreversibly tip these landscapes into a cycle of dryness, diminishing resilience and declining livelihoods.

A few faint beeps on the radar, now and then, are those of the academia, research institutions, and social-thinker-practitioners who place facts in the public domain and urge all to err on the side of caution. While the resolve of the people of both Karnataka and Goa to divert the water on the one hand and to protect one's lifeline on the other grows stronger by the day, the rivers, mountains, forests, winds, and oceans carry on telling their tales—like they have for millennia—in tongues that, most people, little care to heed.

12. Summary of Facts, Research Findings and Recommendations

1. Water awarded for diversion i.e., 2.18 TMC is at the cost of irreparable damage to forests and irreversible ecological losses and avoidable burden on the state exchequer.
2. Desilting the Naviluteertha Dam (Renukasagar Reservoir) of the Malaprabha Dam alone, apart from several other options, will make available 6 TMC at a fraction of the cost of diversion.
3. Reclaiming and restoring the flow of Bennihalla will provide up-to 3 TMC of water, while adopting water efficient irrigation for sugarcane such as use of drip and sprinkler irrigation can save up-to 48 TMC of water.
4. A careful examination of the constitutional provisions, statutory requirements, environmental realities, socio-cultural and livelihood practices, health and economic considerations indicate that the project, in the long term, is untenable.

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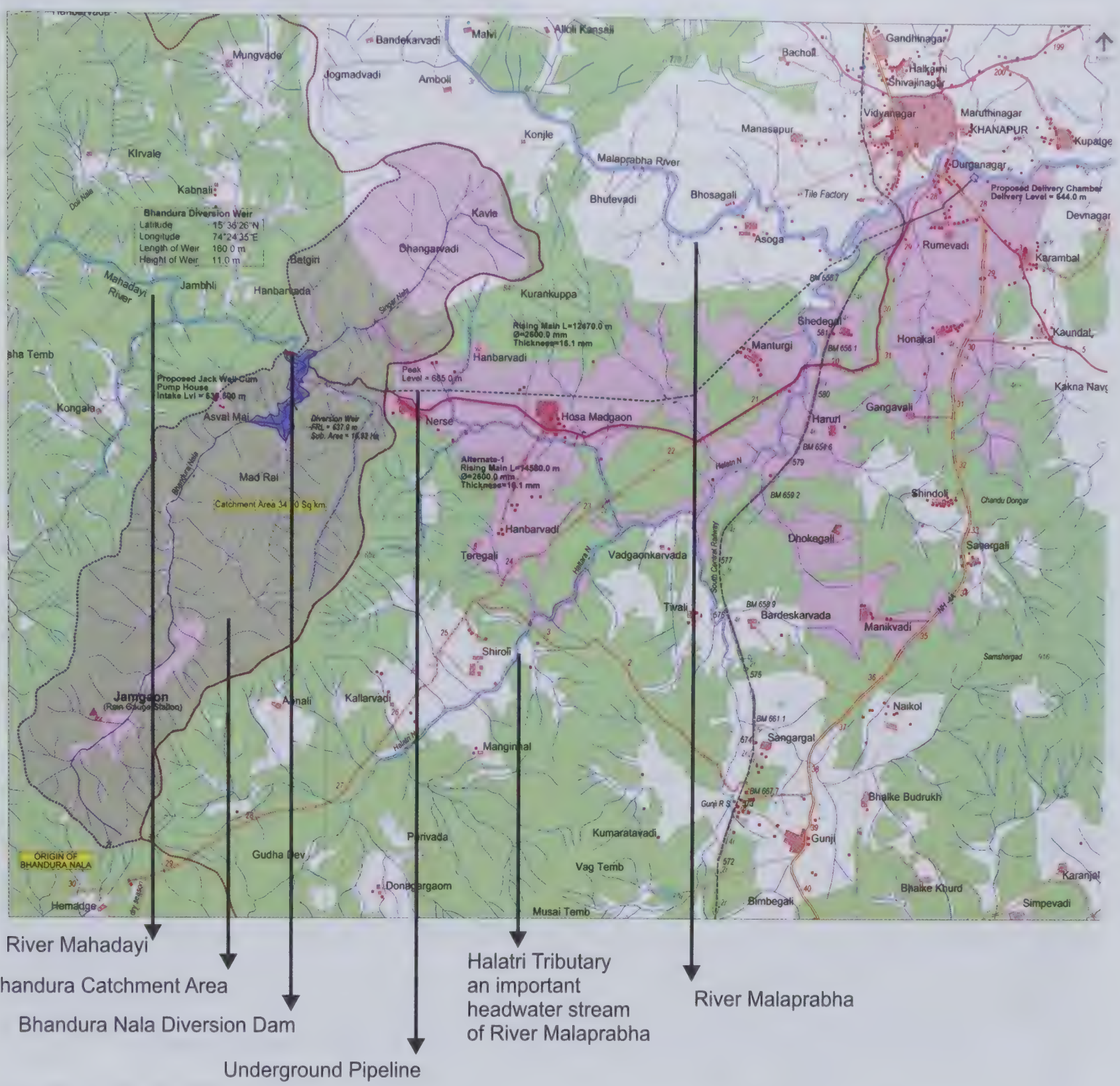
PART I

Effects of Bhandura Nala Diversion

1. Bhandura Dam: Catchment Area, Tribunal Award, Flows and Capacities

Location of Bhandura Dam and its Catchment Area



Mahadayi Water Disputes Tribunal (MWDT) Award Extract

"The State of Karnataka shall undertake fresh planning and development of schemes for consumptive uses within the basin and/or diversion of water outside the basin, including the reservoir losses, etc., for not more than 61.8 MCM (2.18 TMC) at the proposed Bhandura dam site."

Bhandura Nala Flows and Capacities

75% dependable yield 2.6 TMC

Tribunal-approved diversion 2.18 TMC.

Ecological Flow remaining :

2.6 TMC – 2.18 TMC = 0.4 TMC (Only 16%)

16% E-Flow is gross short of required 30% E-Flow out of Monsoon Flow

Such low E-Flow can have a serious impact on the aquatic ecosystems downstream, wildlife in the Bhimgad Wildlife Sanctuary (especially amphibians, fish, and riparian species) and the base flow contribution to the Mahadayi River. This will damage the moisture pump vital for rainfall in North Karnataka and rainfall in the head water spring and streams of Malaprabha River.

Recommended E-flow for a Dam

Season	Recommended E-flow (% of natural Flow)
Monsoon	30%
Post-Monsoon	20%
Lean season	25%

Since Bhandura Nala originates in a pristine forest area (35 Sq Km) within Bhimgad Wildlife Sanctuary, its base flow during non-monsoon months is ecologically significant. Actual measurements would require stream gauging data or hydrological modelling using rainfall-runoff coefficients, remote sensing etc..

Though the E-flows are calculated, Section 29 of Wildlife Protection Act, 1972 does not allow any diversion to ensure 100% flow in to the Wildlife Sanctuary

The MoEF&CC and Central Water Commission recommend maintaining at least 30% of average flow in monsoon.

Making a Case for Environmental Flow Calculations at 90% Dependability

All computations for environmental flows (e-flows) to be retained in Bhandura Nala and the maximum annual diversion/lift proposed under the diversion scheme, must be carried out on a minimum of 90% dependability (i.e., available water flow in 9 out of 10 years).

The present use of 75% dependability to estimate divertible yield is appropriate only for irrigation projects. Given the perennial nature of the reach, the ecological sensitivity of the Mahadayi basin, the precautionary principle *(Refer Annexure I)* and precedents in tribunal and appraisal practice, the e-flow and diversion design must be revised to 90% dependability. Doing so will help in avoiding irreversible ecological harm and supply failures in drought years.

The location of the Bhandura Nala diversion dam falls within ESZ 1 as per Prof. Madhav Gadgil committee's WGEEP Report; in ESA as per Dr. Kasturirangan High-Level Working Group (HLWG) Report, in ESZ Category1 as per IISc / ENVIS (Ramachandra et al.) scientific study delineations.

Given the ecological sensitivity of the region, it is only pertinent that the Precautionary Principle be applied prior to any decisions being taken. This is being doubly strengthened by Articles 48-A & 51-A (g) of the Constitution and NGT jurisprudence. Additionally, the climatic uncertainties in the short, medium and long term due global warming and its potential adverse impacts on forest and local hydrology must also be factored in.

Flow calculations based on ≥90% dependability will safeguard ecological flows, protect the forest and reduce the risk of irreversible damage to the Bhimgad Moisture Pump Forest. This approach aligns with CWC guidelines and hydrological prudence, especially for projects impacting drinking water and critical forest ecosystems. *(Refer Annexure II)*

Recalculation of Flows and E-Flows in TMC at 90% Dependability

Depend-ability	Annual Yield	Monsoon Yield	Monsoon Diversion	Monsoon Evaporation	Deficit in Diversion	Monsoon E-Flow
90%	1.9	1.8	2.2	0.0	**0.4**	**0.0**

The E-Flow and available yield drawn for the 90% dependability clearly shows that there is no E-Flow and the yield grossly falls short for the diversion of 2.18 TMC.

A clear warning that this is a case similar to the Yettinahole Debacle ***(Page 49)***

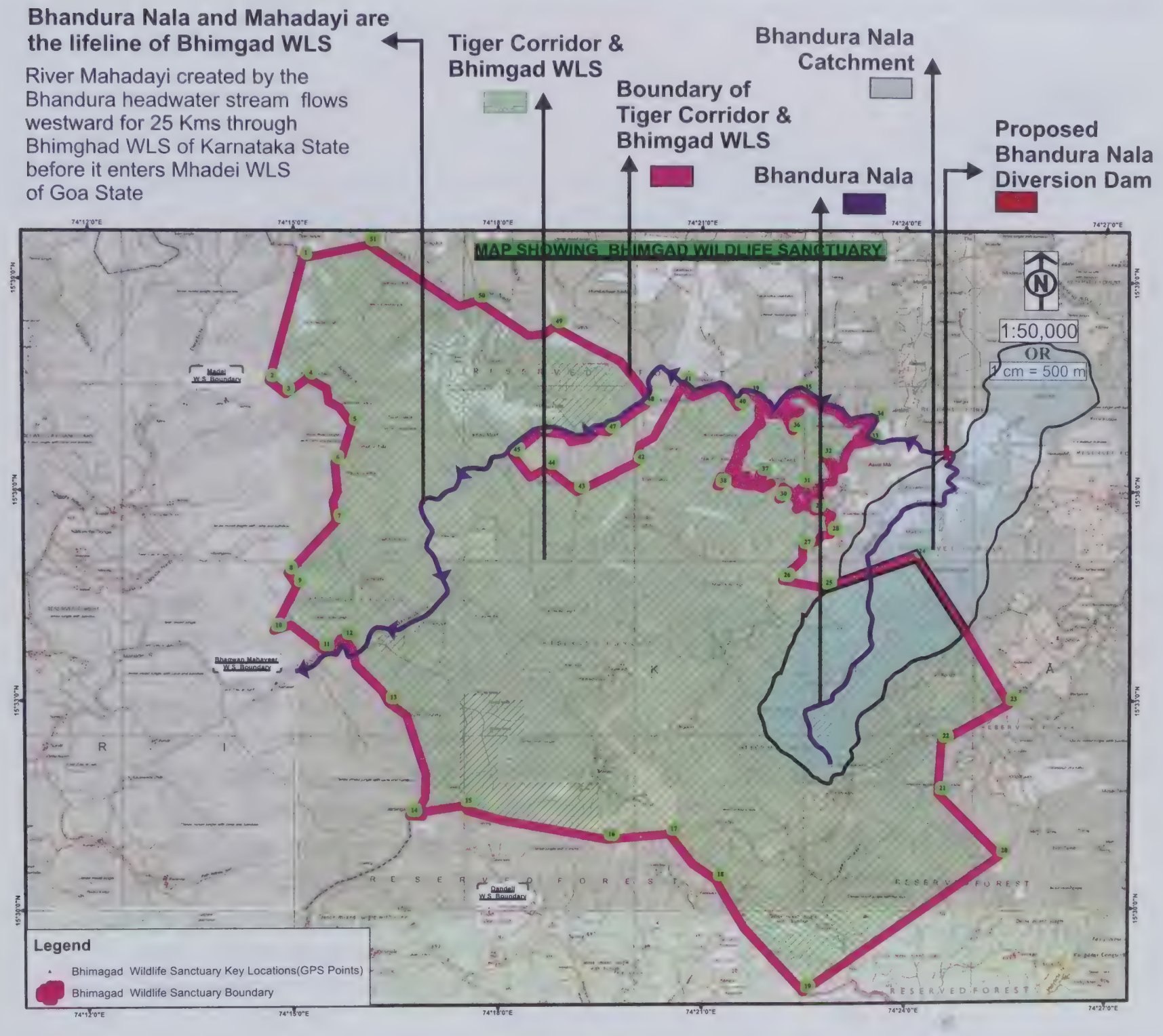
2. Importance of Bhandura Nala for Bhimgad Wildlife Sanctuary

Bhandura Nala is the Headwater Spring-stream of Bhimgad WLS

Location of Proposed Bhandura Nala Diversion Project & its Catchment and Submergence Area with respect to Bhimgad WLS

Bhandura Nala and Mahadayi are the lifeline of Bhimgad WLS

River Mahadayi created by the Bhandura headwater stream flows westward for 25 Kms through Bhimghad WLS of Karnataka State before it enters Mhadei WLS of Goa State



"Wildlife sanctuary headwaters" means the initial parts of a river system that rise within the protected boundaries of a wildlife sanctuary.

The headwater spring-stream is important for the following reasons

- Ecological Sensitivity: These areas host unique ecosystems, rare species, and play a vital role in maintaining forest and riverine health
- Water Source: They are critical sources of clean freshwater for downstream regions
- Wildlife Dependence: Many species rely on perennial flow from these headwaters for survival, especially during dry seasons
- Vulnerability to Diversion or Deforestation: Any development (like damming, diversion, or deforestation) in headwater regions can seriously impact both the sanctuary, forest and down-stream ecosystems.

The Bhandura Nala originates in the Bhimgad Wildlife Sanctuary making it the headwaters of the Mahadayi river system. Studies have shown that interfering with

it will affect the sanctuary's water availability, forest health, and downstream water security.

Bhandura headwaters are essential for ecological integrity, water quality, biodiversity, climate resilience of Bhimgad WLS of Karnataka State.

Mahadayi river originates as Bhandura Nala as headwater stream and then flows through the Bhimgad WLS (Karnataka) for 25 kms before entering Mhadei WLS (Goa). Bhandura Head-waters are essential for the ecological integrity, water quality, biodiversity and climate resilience Bhimgad WLS of Karnataka State.

After The Bhandura dam location (see map) of Bhandura Nala the Mahadayi traverses for 24 kms in Bhimgad WLS Karnataka as a lifeline for the WLS.

Bhandura Nala, as a headwater spring and stream of the Mahadayi River within Bhimgad Wildlife Sanctuary, represents the very first input into an extraordinarily complex and non-linear ecological and monsoonal system. Any diversion of this spring is not a minor alteration but a fundamental disruption at the source point. It is akin to triggering a butterfly effect at the very beginning of the chain—where even a small disturbance cascades outward, amplifying through hydrological, climatic, and ecological feedback loops that sustain the Western Ghats, the Mahadayi, and the broader rainfall systems of the region.

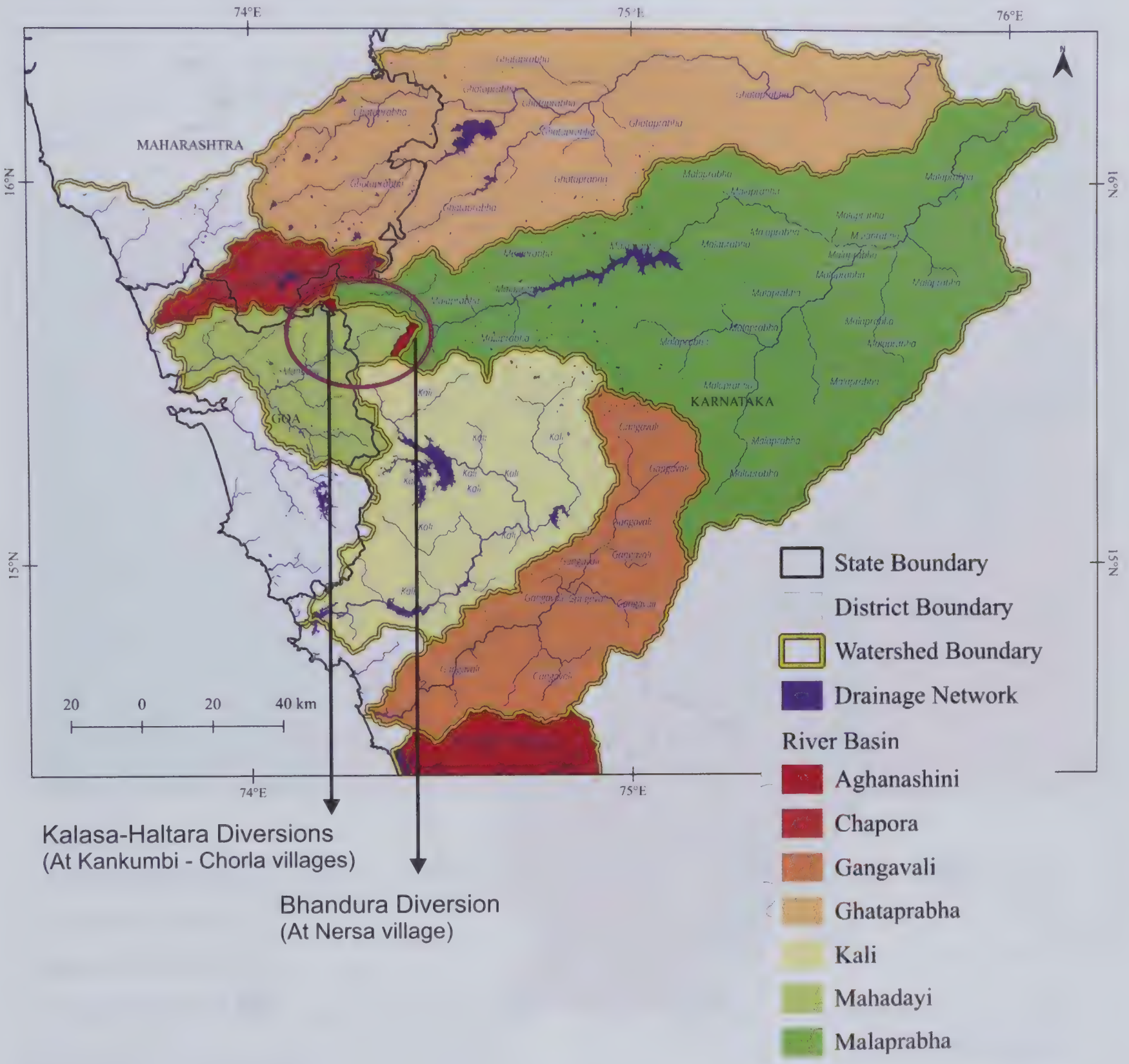
The Butterfly Effect

The term "butterfly effect," in chaos theory, describes how a tiny change in initial conditions can trigger disproportionately large and unpredictable consequences in complex systems. Just as the flap of a butterfly's wings can alter weather patterns far away, a small disturbance at the headwaters of a river can ripple through hydrological, climatic, and ecological cycles-ultimately reshaping rainfall, ecosystems, and livelihoods across vast regions.

(Refer Annexure III)

3. Mahadayi Diversion Projects in Eco Sensitive Region Category 1

Proposed Bhandura Kalasa Haltara Project Locations and Adjacent River Basins

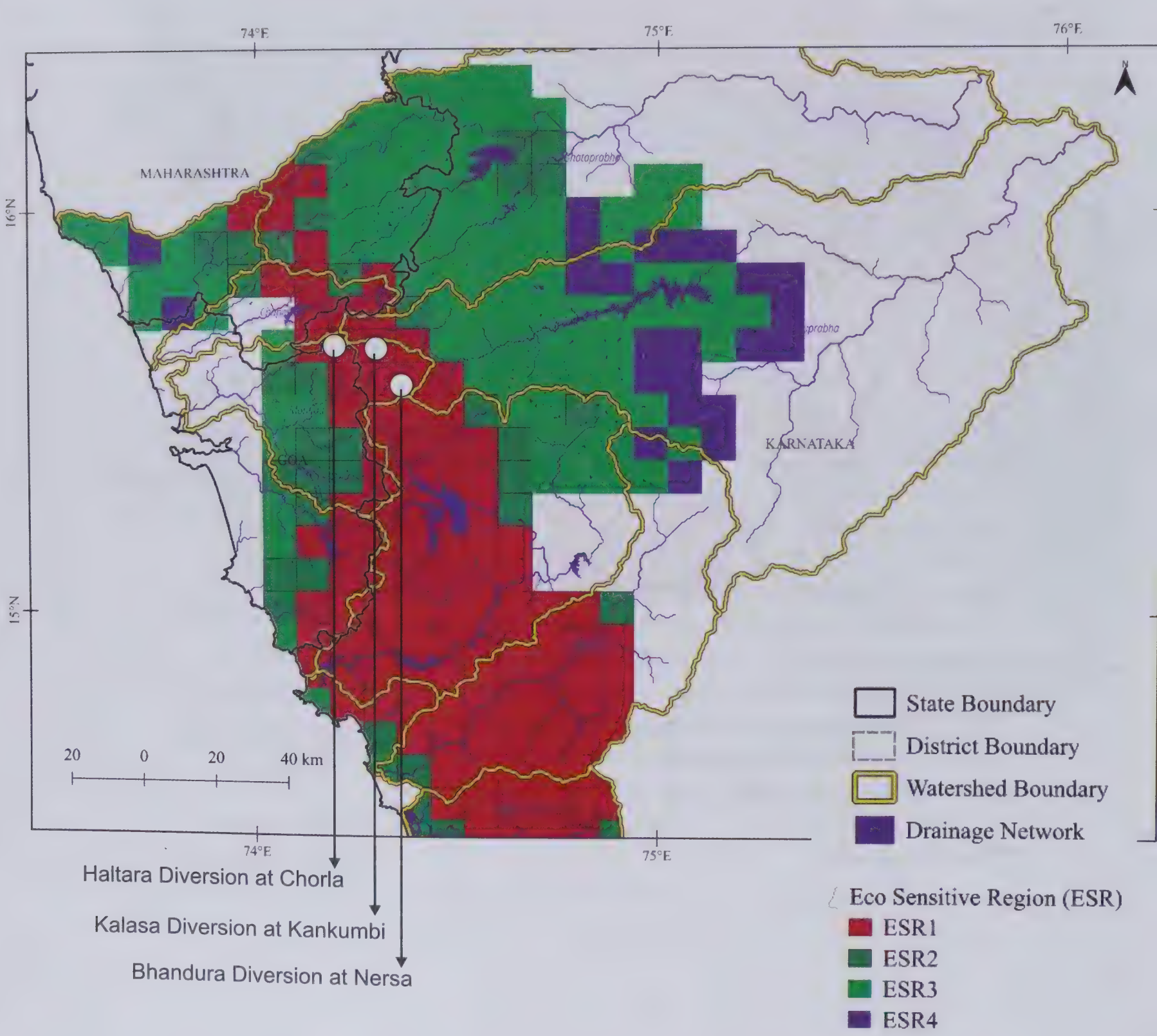


Ecologically Sensitive Regions (ESR) in Northern Karnataka River basins, Central Western Ghats

Village-wise Data Based on Three Decades of Research in the Western Ghats

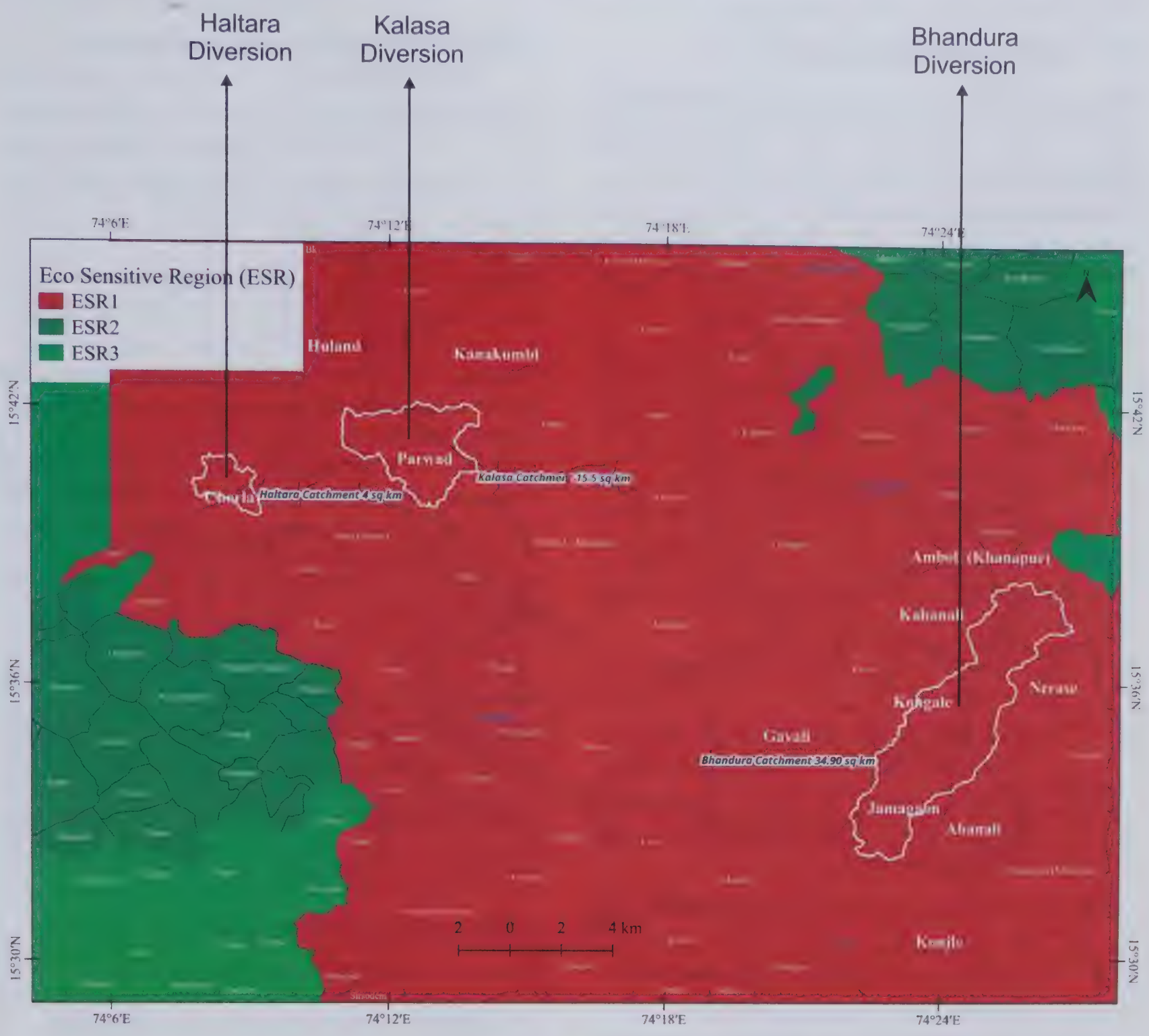
By

IISc-EIACP, Energy & Wetlands Research Group
Indian Institute of Science, Bangalore, India – 560012



Eco-Sensitive Regions (ESR) in Northern Karnataka River basins, Central Western Ghats (prioritized considering bio-geo-climatic, ecological, environmental and social parameters) based on Western Ghats Spatial Decision Support System (WGSDSS) - Ecologically Sensitive Regions in the Western Ghats (https://wgbis.ces.iisc.ac.in/sdss/wgsdss/v2/)

Bhandura Kalasa Haltara Project – Proposed in Eco-sensitive Region (ESR 1)



Eco Sensitive Region (ESR) ESR1 ESR2 ESR3

The **Indian Institute of Science (IISc)** has repeatedly cautioned against constructing dams and river diversions in *Eco-Sensitive Regions, Category-I* (such as the pristine evergreen forests of the Western Ghats). Their research, especially from the Energy & Wetlands Research Group (Prof. T.V. Ramachandra et al), shows that such interventions trigger multiple ecological and hydrological consequences.

Their consistent conclusion is that **Category-1 Eco-Sensitive Regions must be left intact**, as even "small" diversions create *self-reinforcing degradation loops*:

- Less forest → less rainfall → drier soils → more forest loss → worsening desertification.
- Less flow → higher estuarine salinity → lower evaporation → reduced rainfall → further stream shrinkage.

IISc's position is that constructing a dam in Eco-Sensitive Category-1 zones and diverting water is ecologically disastrous: it disrupts hydrological balance, accelerates regional desertification, undermines rainfall stability, and violates both national laws and international obligations.

4. Diverting Bhandura Nala Even in Very High Rainfall Area Matters

4.1 Effect on Wildlife Sanctuary

Bhimgad WLS receives very high annual rainfall of approximately 3,800 mm (150 inches).This abundant rain supports both the local ecosystem and downstream needs. Diversion of Bhandura Nala can substantially affect Bhimgad Wildlife Sanctuary, even though the region has high overall water yield. This is so for the following reasons.

(i) Local Hydrological Sensitivity

- Bhandura Nala is a first-order stream, part of the headwaters of the Mahadayi River, meaning it is critical to sustaining baseflow and microhabitats in its immediate zone
- Not only first-order streams, but even small tributaries in such ecologically sensitive areas are vital for amphibians, fish, and riparian vegetation, which are highly localised and dependent on uninterrupted flows

(ii) The Sanctuary's Wildlife Depends on Microhabitats

- The endemic and threatened species rely on specific aquatic and moist forest niches
- Water diversion will dry or alter these habitats, even if the larger catchment still receives rainfall

(iii) Flow Timing and Eco flows are Critical

- It is not just the volume, but the timing and continuity of flow that matter for ecosystems
- Seasonal low-flow months (non-monsoon periods) are particularly vulnerable-diverting the flow of a first order stream like Bhandura Nala will reduce the baseflow in downstream sections, affecting the survival of aquatic life

  Diverting Bhandura will fragment the hydrological network inside the sanctuary.

(iv) Protected Area Regulation (Legal Viewpoint)

- As per Section 29 of the Wildlife Protection Act, 1972, any diversion affecting water availability inside a sanctuary is prohibited unless it serves the sanctuary's management purposes.
- Therefore, any such diversions like the Bhandura are seen as ecologically and legally significant.

Diverting Bhandura Nala will ultimately lead to the loss or degradation of evergreen forests in Bhimgad Wildlife Sanctuary. While the impact may not be immediate or widespread at first, scientific evidence shows that stream diversions in forested headwater catchments have cascading effects on forest structure, species composition, and microclimate—especially in tropical evergreen ecosystems like Bhimgad

4.2 Bhandura Nala Flow Data

The yield of the Mahadayi (Mandovi) River Basin refers to the total volume of water generated annually in the basin from rainfall, runoff, and baseflow. Several assessments have been made over time, particularly in the context of the Mahadayi Water Disputes Tribunal (MWDT).

Mahadayi (Mandovi) River Basin

Total Annual Yield of Mahadayi Basin

- Geographical Area of Basin : 2032 Km^2
- Average Annual Yield : 251 TMC
- Dependable Yield (75%) : 188 TMC

Includes Bhimgad WLS, Mhadei WLS and their eco-sensitive zones admeasuring about 500 sq km

State	Area of River Basin	Percentage Water	Tribunal Allocations	Proposed Diversion TMC
Goa	1580 Km^2	78%	24.15	-
Karnataka	375 Km^2	18%*	3.9	Bhandura Nala 2.18 Kalasa Nala 1.72
Maharashtra	77 Km^2	4%	1.33	-

*** This 18% of diverted water comes from the headwaters in the Western Ghats Forests.**

Data as per Mahadayi Water Disputes Tribunal Final Report (MWDT), (2018)

4.3 Calculation of Bhandura Nala Flow and Yield of Bhimgad WLS

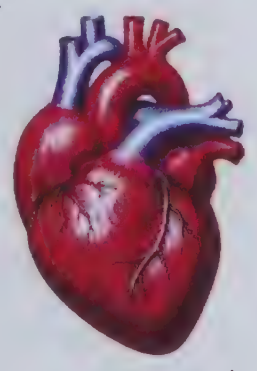
(Based on water allocation principles of MWDT)

Area of Bhimgad WLS	190 km2
	Rain Yield = 12.9 TMC
Diversion from Bhandura	2.18 TMC

% of Diversion/Bhimgad WLS Rain Yield 17 %

The complete diversion of Bandura Nala is akin to blocking a headwater tributary completely. (Refer Page 20) This diversion will result in effectively reducing the water by 17% in the Bhimgad WLS. This blocks the prime headwater stream and spring of a sanctuary which is the most important Moisture Pump for Bhimgad WLS, Malaprabha Basin, Mahadayi Basin & for North Karnataka. Such quantum of diversion will trigger a calamitous self-reinforcing forest degradation - rainfall reduction loop.

"To argue that the blocking of the main tributary causing 17% reduction in water yield is not substantially damaging to the Moisture Pump or sanctuary is like claiming blocking of a main artery causing 17% loss in blood supply to the heart is harmless - **both lead inevitably to long-term dysfunction and collapse."**



Scientific/ Institutional References

1. *Mahadayi Water Disputes Tribunal (MWDT) Final Award, 2018*
2. *WRIS* India – Basin-level hydrological data
3. *ATREE & SACON Report (2020)*: Ecological Services of the Mahadayi Basin
4. *S. Vishwanathan (2022):* Rainfall and Runoff Trends in Western Ghats

4.4 Diversion Leads to Loss of Sanctuary's Evergreen Forests

Diverting the waters from the Bhandura Nala will lead to loss of Evergreen Forests within the

Bhimgad Wildlife Sanctuary and its Eco Sensitive Zone in the following ways:

(i) Disruption of Soil Moisture & Subsurface Water

- Evergreen forests depend on high soil moisture, even during non-monsoon months
- Bhandura Nala, being a spring-fed stream, supports percolation into nearby forest soils
- Diversion reduces water infiltration, causing drying of forest floors, especially on ridges and slopes leading to tree mortality and decline of shade-loving undergrowth

(ii) Loss of Streamside Microclimate (Riparian Zones)

- Evergreen forests thrive on humid microclimates supported by nearby flowing water
- Diverting the stream reduces humidity, increases temperature, and leads to invasion by deciduous or invasive species like Lantana camara, Chromolaena odorata and others

(iii) Fragmentation of Moisture Corridors

- Perennial streams like Bhandura act as moisture corridors for flora and fauna
- Removing one stream breaks ecological continuity, especially for amphibians, insects, and moisture-dependent plants. This fragments the habitat, leading to local extinction of species and forest thinning

(iv) Fire Risk in Drying Zones

- Drier patches (due to lost water flow) are more prone to wildfires
- Evergreen forests, once exposed to fire, often fail to regenerate as true ever- green. They revert to semi-evergreen or dry deciduous forests

(v) Altered Species Composition

- With declining water availability, species like Terminalia, Lagerstroemia, and deciduous Dipterocarps may outcompete native evergreen species like Myristica, Holigarna, and Diospyros.

Bhimgad's evergreen zones are concentrated along stream valleys and perennial spring-fed catchments like Bhandura Nala. These forest types are highly sensitive to hydrological alterations. Even minor diversions can dry the soil, alter the canopy cover, and transform ecological conditions—ultimately leading to loss of evergreen forest cover in patches

Scientific / Institutional References

1 Ramachandra et al (IISc, 2024) demonstrate that reduced stream flow from catchment modification causes vegetation type shifts from evergreen to secondary or degraded forests.

2 ATREE Fieldwork (Western Ghats) studies in Agumbe, Sirsi, and Uttara Kannada show that forest patches near disturbed streams transition to moist-deciduous formations within 5–10 years.

3 SACON Landscape Ecology Studies stress that hydrological continuity is a keystone ecological function for Western Ghats evergreen zones; its loss triggers cascading degradation.

4.5 Evergreen Forest Degradation Reduces Rainfall

(i) Forests Drive Rainfall via Evapotranspiration

- Evergreen forests transpire moisture into the atmosphere, feeding local cloud formation
- This "biotic pump" effect helps sustain local convective rainfall, especially in pre- and post-monsoon months
- Cutting or drying forests lowers transpiration, leading to less cloud formation and reduced local rainfall

(ii) Disruption of the Orographic Rainfall Mechanism

- Western Ghats receive rainfall when moist winds from the Arabian Sea rise over forested slopes, cooling and condensing into rain
- Forests enhance moisture capture and recycling. Their loss makes slopes hotter and drier, disrupting this orographic uplift.
- IISc and ATREE studies show a decline in pre-monsoon and post-monsoon showers in degraded catchments

(iii) Loss of Cloud Condensation Nuclei (CCN)

- Forests release volatile organic compounds (VOCs) that act as cloud condensation nuclei
- Degraded forests emit fewer VOCs leading to fewer clouds resulting in reduced rainfall

(iv) Consequences of Change in Land use and Land cover

In Uttara Kannada and Kodagu, degradation of forest patches for dams, roads, and agriculture led to:

- Drying of smaller catchments
- Reduced rainfall (especially post-monsoon)
- Decline in groundwater recharge
- Conversion of formerly evergreen zones to dry deciduous or scrub forest

Degradation of evergreen forests—like those in Bhimgad—can reduce rainfall by lowering transpiration and humidity, disrupting the orographic uplift, reducing cloud formation, and triggering a regional climatic self-reinforcing feedback loop of further drying and continued forest degradation. This would pave the way for semi-permanent drying of moist zones, especially in upper catchments like Bhimgad; creating a double ecological loss, first in stream flow, then in rainfall, followed by loss of regeneration capacity. Thus, completely degrading evergreen forest as the years pass.

Scientific / Institutional References

1. Gunnell & Krishnamurthy (ATREE/IISc, 2003–2012) found rainfall declines of up to 30% in Western Ghats areas where evergreen forest was replaced with plantations or cleared.
2. Ramachandra et al. (IISc, 2018–2024) GIS and remote sensing studies showed negative correlation between forest degradation and rainfall in central Western Ghats. Further, confirmed that deforestation decreases regional humidity and cloud cover, even in high-rain zones.
3. World Bank/ ISRO Studies have shown that large-scale forest degradation in Karnataka's Ghats shifted monsoon patterns, delaying onset and reducing spatial coverage of rainfall.

(v) Tamil Nadu Case Study

IIT Bombay's Western Ghats Specific – Tamil Nadu Case Study showed that dense forest in the Ghats contributes 25–30% of Tamil Nadu's monsoon moisture, rising to 40–50% during dry years.

Removing forest caused a 1–2.5 mm/day rainfall drop locally.

4.6 Effect of Degradation of Bhimgad WLS on Peninsular India, East-Northeast of the Bhimgad Region

The degradation of evergreen forests in Bhimgad of the central Western Ghats, which act as a climate stabilizer and water source for the entire southern Deccan Plateau and surrounding areas can have serious downstream climate and hydrological consequences for Peninsular India, particularly the eastern and north-eastern regions such as parts of northern Karnataka, Telangana, Andhra Pradesh, and even parts of Maharashtra.

(i) Reduced Rainfall Downwind of Bhimgad

- Evergreen forests in the Western Ghats, like Bhimgad, supply atmospheric moisture via transpiration
- This moisture is transported eastward by prevailing monsoon wind.

- Forest loss → less moisture contribution → less rainfall east of the Ghats, especially in:
  - ➢ Belagavi, Bagalkot, Kalaburagi
  - ➢ Hyderabad region (Telangana)
  - ➢ Upper Krishna and Tungabhadra basins

Scientific / Institutional Evidence

Ramachandra et al. (IISc) and Gunnell (ATREE) show that 30–40% of rainfall in leeward Karnataka is linked to Western Ghats moisture recycling. Forest degradation decreased pre-monsoon and retreating monsoon rains, crucial for cropping in rain-fed regions.

(ii) Decline in Groundwater Recharge in Dry Zones

- The Ghats supply baseflow to many east-flowing rivers (like Malaprabha, Ghataprabha, and Tungabhadra)
- Degraded forests disrupt subsurface flow, reducing groundwater recharge in drought-prone districts east of Bhimgad
- This contributes to water scarcity in places like Bagalkot, Raichur, and Koppal

(iii) Warming and Climate Extremes

- Forests regulate local temperatures. The loss of forest cover leads to increased surface temperatures across eastern plateau regions
- This intensifies heat-waves, dry spells, and erratic rainfall, affecting:
  - ➢ Dry-land farming systems
  - ➢ Monsoon-dependent crops like jowar, tur, cotton
  - ➢ Rural water supply schemes

(iv) Weakened Monsoon Stability

- Forest loss in the Western Ghats, especially the central segment (Bhimgad–Kudremukh belt), reduces monsoon resilience.
- Studies by ISRO & IITM Pune show it leads to:
  - ➢ Delayed monsoon onset
  - ➢ Reduced spread of monsoon to inner peninsular regions
  - ➢ Shorter rainy season

(v) Impact on Agricultural Yield and Livelihoods

- Rain-fed areas to the east rely on stable rainfall patterns originating from the Ghats
- Forest degradation in Bhimgad can lead to:
  - ➢ Crop failure due to rainfall reduction
  - ➢ Shift in sowing seasons
  - ➢ Increased migration from rural dry belts
  - ➢ Dependency on borewells, further exhausting groundwater

(vi) Areas Affected East-Northeast of Bhimgad:

Zone	Impact
Belgaum Plateau	Less rainfall, drying of rivers like Malaprabha
North Karnataka	Rainfall deficit, groundwater stress
Telangana (North)	Reduced monsoon inflow, warmer dry spells
Maharashtra (Vidharbha)	Weakened rainfall onset, crop stress
Rayalaseema	Less winter/post-monsoon rains

The degradation of evergreen forests in Bhimgad is not a local problem. It threatens:

- Regional rainfall stability
- River and groundwater flows
- Rain-fed agriculture
- Rural climate resilience

Especially in east and northeast peninsular India, located downwind of Bhimgad, such ecological damage can trigger broader climate instability and drought risks.

4.7 Effect of Bhandura Nala Diversion on Halatri Nala

The Halatri Nala, a headwaters tributary of the River Malaprabha runs parallel and in close vicinity to Bhandura Nala; both flow on either side of the same ridgeline.

Any disturbance due to Bhandura Dam and its associated structures as well as the actual diversion will adversely affect the local temperature, microclimate and rainfall. This will have an impact on the yield of the Halatri tributary, in turn affecting the yield of the Malaprabha.

5. Compensatory Afforestation Proposed

According to the official diversion application (Form A) on Parivesh Portal, the proposed project involves diverting 28.4427 hectares of forest land for essential infrastructure (diversion dam, pump house, pipelines, etc.) To compensate, the User Agency has identified two locations in Belgaum district:

- Amate Village: 25 hectares
- Halahalli Village: 6 hectares

Together, this amounts to 31 hectares of non-forest or revenue land allocated for compensatory afforestation.

(i) Does Compensatory Afforestation Actually Compensate?

The pristine, biodiverse forests surrounding the headwater streams of Bhimgad Wildlife Sanctuary (WLS) are under imminent threat of deforestation by Bhandura Diversion Project. The proposed compensatory afforestation is far from the original site and cannot truly offset the irreversible damage caused by:

- Loss of native forest cover in an ecologically sensitive Category 1 region
- Fragmentation of critical habitats for endangered and endemic flora and fauna
- Human and mechanical intrusion into untouched ecosystems
- Disruption of headwater springs, leading to reduced downstream flow and potential drying of vital forest

This is not merely a matter of tree loss—it is the dismantling of a complex, interdependent web of life. The ecological costs far exceed the visible footprint of deforestation. Once disturbed, these ecosystems may never recover their original integrity, threatening biodiversity and long-term environmental stability.

The loss is many times more than the apparent 31 hectares.

Compensatory afforestation elsewhere cannot replicate the unique ecological functions of Bhimgad forests. Protecting this forest is not just a conservation priority—it's a moral imperative.

Also this fragmentation and human and mechanical intrusion should not be seen in isolation but should be seen in conjunction with other proposed projects in the near vicinity like Kalasa, Haltara diversion, Kotni hydroelectric project, double-laning of railway tracks in Bhagwan Mahaveer National Park, Goa-Tamnar high tension electric power line tearing apart through three WLS.

A recent study by IIT Powai (Bombay) for the period 2015 to 2019 revealed that all states in India record a net loss in forest cover. While 56.3 sq. km was added 1,032.89 sq. km was lost, showing that India lost 18 sq. km of forest for every 1 sq. km it gained.

One of the most critical observations of the study was the quality of forest cover being added. More than half of the newly-added forests were islets or fragmented. They lacked what the researchers call "structural connectivity" to the continuous spread of green that sustains biodiversity.

Reference: India Biodiversity | India lost 18 times more forest than it gained, TN, Bengal led deforestation: IIT study - Telegraph India

https://www.telegraphindia.com/india/india-lost-18-times-more-forest-than-it-gained-tn-bengal-led-deforestation-iit-study/cid/2116564 (Accessed on 07-08-2025 at 12:21 IST)

Between 2001 and 2019, India lost 23,300 square kilometres of tree cover. In the 2024 Global Nature Conservation Index it ranks 176th out of 180 nation signalling a biodiversity emergency with deforestation, weakened forest laws and climate change impact.

Biodiversity in India | Why India ranks among the bottom five countries in new global nature conservation index - Telegraph India

Reference:

https://www.telegraphindia.com/gallery/why-india-ranks-among-the-bottom-five-countries-in-new-global-nature-conservation-index-photogallery/cid/2059428 (Accessed on 07-08-2025 at 12:16 IST)

(ii) Suppression & Falsification of Vital Information

The Form A on Parivesh Portal submitted by Karnataka State Forest Department with regard to the transfer of forest land by way of compensatory afforestation falsifies and suppresses the fact that the proposed area to be transferred for the project is not within 10 kms of wildlife sanctuary or tiger reserve. The fact is, and the evidence shows, that the area is actually within 2 km of Bhimgad WLS and the tiger corridor.

The form also hides the fact that the forest land to be transferred for the proposed project diverts water from and to the Bhimgad WLS and tiger corridor. ***This is in contravention of Section 29 of Wildlife Protection Act1972***

English

परिवेश PARIVESH (CPC GREEN)

पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय
Ministry of Environment, Forest and Climate Change

Total 1 No. of results found

List of Proposals

Download

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S. No.	Proposal No.	Clearance Details	Project Name	Location	User Agency	Other Details	Proposal Status
1	FP/KA/WATER/460216/2024	**Clearance Type:** Form-A (Part-I): Diversion of Forest Land **CAF No.:** CAF/155360/2024 **S/W No.:** SW/170231/2024	Diversion of 28.4427 Ha (revised from 22.8091 ha) forest land for construction of diversion dam, Jackwell cum pump house, electrical substation, pipe line and power line in Nerase, Mantharga, Bacholi and Haruri Villages of Khanapur Taluk in Belgaum District under Bhandura Nala Diversion Scheme	KARNATAKA	EXECUTIVE ENGINEER KNNL KALASA PROJECT DIVISON BELAGAVI	**Category :** Drinking Water **Date of Submission:** 01/02/2024	Pending at IRO Head

State: KARNATAKA
Project Category: Drinking Water
Area (ha): 28.4427
Application For: Form-A (Part-I): Diversion of Forest Land
Date of Submission: 01/02/2024
Scenario : Scenario 2
Demand/Payment:
Additional Demand/Payment:
In-Principle Letter: In-Progress

Extract from Parivesh Portal Dated 13-09-2025 FP/KA/WATER/ 40216/2024

Processed by State Secretary due to EDS by ... 04/08/2025-08/08/2025 ⊕
Processed by Nodal Officer due to EDS by St... 04/07/2025-04/08/2025 ⊕
Processed by DFO due to EDS by Nodal Officer 01/07/2025-04/07/2025 ⊖

Start Date 01/07/2025
End Date 04/07/2025
EDS Replied by **Maria Christu Raja D** (Divisional Forest Officer (DFO)): View (04/07/2025)
FC Form-A (Part II) by **Maria Christu Raja D** (Divisional Forest Officer (DFO)): (Belgaum Division) View (04/07/2025)

Processed by Nodal Officer due to EDS by St... 01/07/2025-01/07/2025 ⊕

FC Form-A (Part-II)

Wildlife Specific Details

9. Significance of the forest land proposed for diversion from wildlife point of view:

9. 1. Details of wildlife present in and around the forest land proposed for diversion	Tiger, Leopard, Civet Cats, Sloth Bear, Gaur, Sambar Deer, Spotted deer etc
9.2. Whether forms part of national park, wildlife sanctuary, biosphere reserve, tiger reserve, elephant corridor, wildlife migration corridor etc	No
9.3. Whether any national park, wildlife sanctuary, biosphere reserve, tiger reserve buffer zone, elephant corridor, wildlife migration corridor etc., is located within 10 Km. from boundary of the forest land proposed to be utilized for prospecting or diversion	No ← **False** *(Refer Page No 45)*
9.4. Whether any rare/endangered/unique species of flora and fauna found in the area	Yes
9.4.1. Details and comments on the impact of Project on such species of Flora and Fauna	Not effect much → ?

6. Desertification of North Karnataka

Desertification is not just the spread of deserts; it includes the land degradation in dry, semi-arid, and sub-humid regions that occurs due to:

- Loss of vegetation
- Declining soil fertility
- Reduced rainfall
- Water scarcity
- Unsustainable land use

North Karnataka is already in the semi-arid zone and hence it is highly sensitive to even small ecological shifts.

6.1 Bhimgad Forest Loss Will Trigger Desertification in North Karnataka

(i) Reduced Rainfall & Longer Dry Spells

- Evergreen forests of Bhimgad contribute moisture to eastward monsoon winds
- Forest loss → less transpiration and cloud seeding → weaker rainfall across eastern districts
- Studies show a 10-30% reduction in monsoon rainfall in degraded Ghats-linked catchments (IISc, ATREE)

(ii) Drying of Rivers & Streams

- The origin of River Malaprabha and all the head water springs and streams, tributaries lie adjacent to Bhimgad and Mhadei WLS, and the location of the Bhandura Dam.
- Forest degradation affects baseflow, reduces non-monsoon availability, and triggers river seasonality
- Forest degradation → dry headwaters → dry river → less irrigation → soil degradation and desertification.

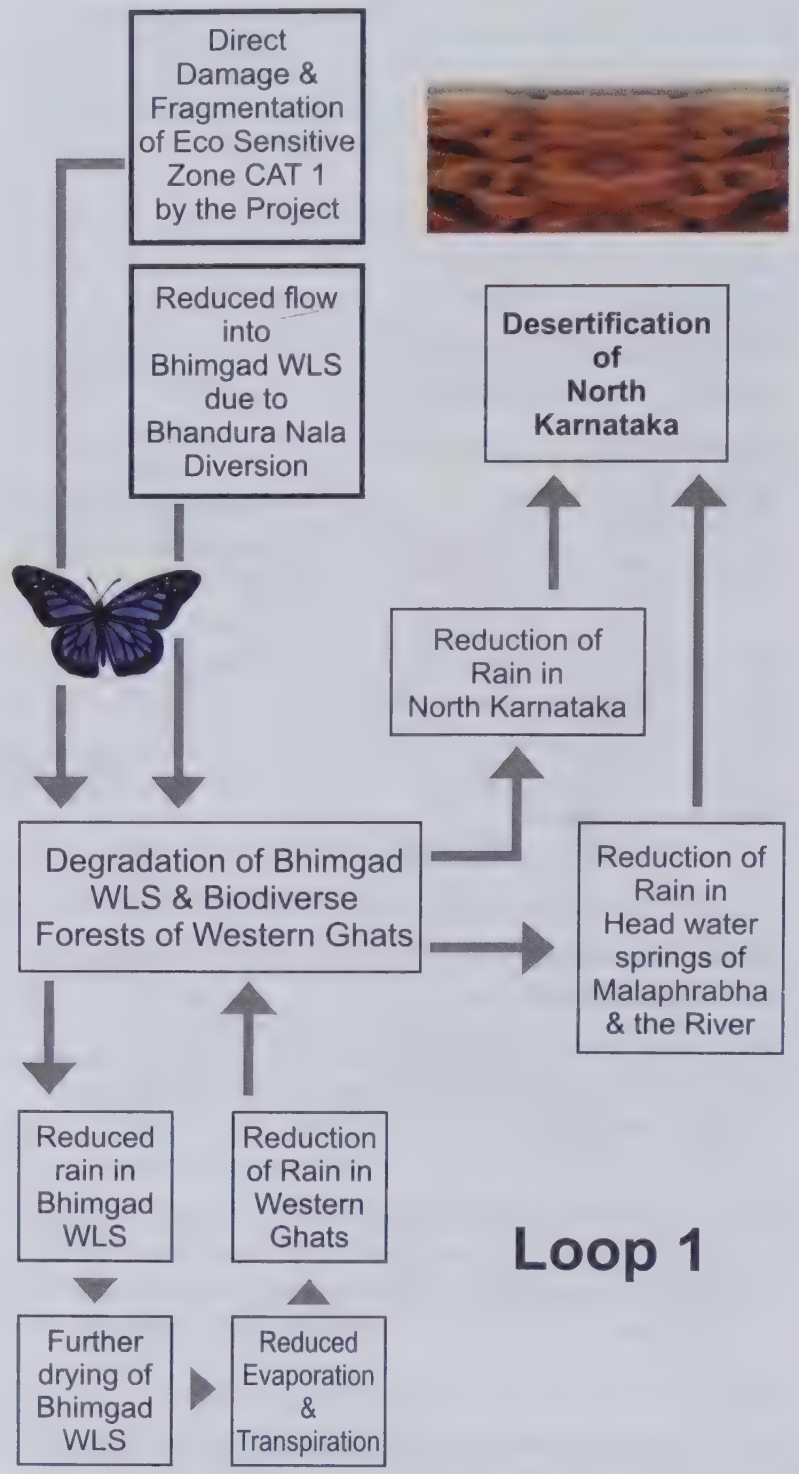
(iii) Groundwater Depletion

- Forested Ghats recharge aquifers and borewells in North Karnataka
- Loss of forest reduces subsurface flow and percolation, causing:
  - Faster groundwater decline
  - Borewell dependency
  - Over-extraction and aquifer collapse

(iv) Increased Soil Erosion & Loss of Vegetation

- Less rainfall stability and vegetation cover leads to erosion of topsoil in sloped farmlands
- Land becomes infertile, cracked, and barren. These are classic signs of desertification
- Shifting cultivation, overgrazing, and monoculture (e.g., sugarcane) worsen it

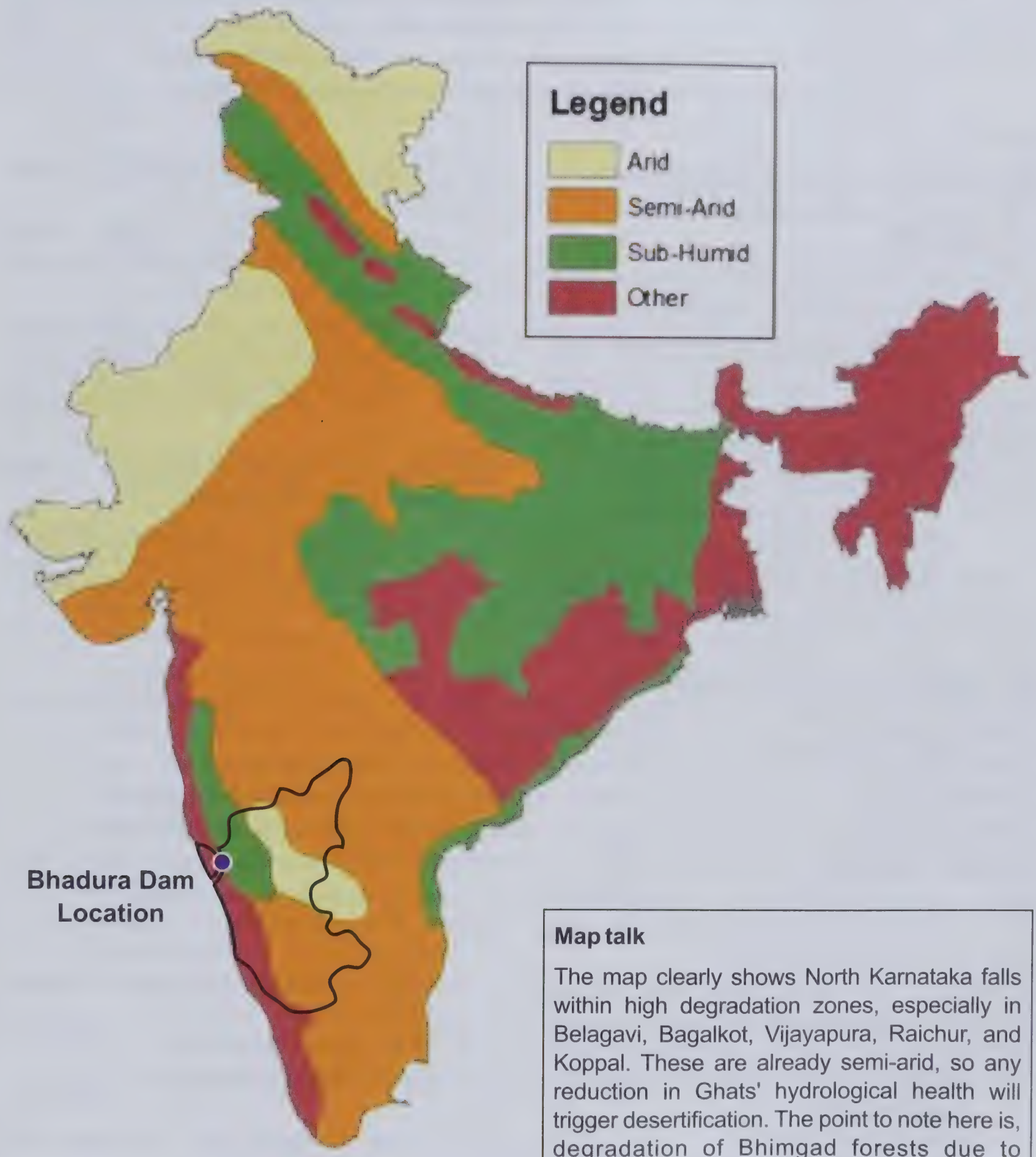
Self reinforcing nonlinear loop leading to Desertification of N. Karnataka triggered by Diversion of Bhandura Nala


Direct Damage & Fragmentation of Eco Sensitive Zone CAT 1 by the Project
Reduced flow into Bhimgad WLS due to Bhandura Nala Diversion
Desertification of North Karnataka
Reduction of Rain in North Karnataka
Degradation of Bhimgad WLS & Biodiverse Forests of Western Ghats
Reduction of Rain in Head water springs of Malaphrabha & the River
Reduced rain in Bhimgad WLS
Reduction of Rain in Western Ghats
Further drying of Bhimgad WLS
Reduced Evaporation & Transpiration
Loop 1

This loop is already visible in Bagalkot and Koppal, where rainfall has reduced and scrubland is replacing cropland, an indication of progressing desertification

6.2 Evidence for Desertification: Scientific and Government

Land degradation within dryland regions is known as desertification. The map shows the dryland regions of India, which comprise 69 percent. Original source: National Bureau of Soil Survey and Land Use Planning, Bangalore. Map extracted from Desertification and Land Degradation Atlas of India. (Refer for further details: Why land degradation in India has increased and how to deal with it. *Article in Mongaby*).



Map talk

The map clearly shows North Karnataka falls within high degradation zones, especially in Belagavi, Bagalkot, Vijayapura, Raichur, and Koppal. These are already semi-arid, so any reduction in Ghats' hydrological health will trigger desertification. The point to note here is, degradation of Bhimgad forests due to diversion project will accelerate desertification.

IISc (Ramachandra et al., 2023) *study links loss of the Ghats' forest cover with desertification trends in east-flowing catchments. It has predicted that the conversion of evergreen to dry deciduous or scrubland can push semi-arid zones into irreversible decline.*

Areas at High Risk

District	Desertification Factors
Bagalkot	Rainfall decline, canal failure, poor recharge
Vijayapura	Overdependence on groundwater, rocky terrain
Gadag	Rain-fed agriculture collapses, topsoil erosion
Koppal	Drying minor rivers, forest loss, and crop failures
Belagavi (east)	Foothill degradation, deforestation upstream

6.3 Desertification Risk in North Karnataka

(i) Severe Land Degradation in North Karnataka

- According to the ISRO 2021 Atlas, ~29% of India's land is degraded. Karnataka accounts for 6.96 million hectares of desertified/ degraded land—about 7.1% of India's total, making it the most affected among South Indian states

(ii) Drying Trends and Rainfall Decline Linked to Ghats Degradation

- Studies and KSNDMC data reveal North Interior Karnataka and Belagavi have experienced significant decrease in annual rainfall since the 1960s, attributed mostly to Western Ghats deforestation.

(iii) Forest Loss in Ghats Intensifies Dryland Vulnerability

- Western Ghats have lost ~35% of forest cover over 90 years and 5% of evergreen forest in the last decade
- Deforestation reduces evapotranspiration, cloud formation, monsoon vigour, and ground infiltration which are key drivers of desertification in downwind areas

(iv) Positive Feedback: Forest Loss → Less Rain → More Degradation

- Reduced rain and baseflows → decline in soil fertility, vegetation → more dryness → more soil erosion → desert-like conditions

6.4 What this means for North Karnataka

Impact Area	Consequence
Rain-fed Agriculture	Frequent crop failure, shifting sowing seasons
Groundwater	Decline in aquifer recharge, increased borewell use
Soil Quality	Erosion, nutrient depletion, and land becoming barren
Climate Resilience	Hotter summers, more droughts, heatwaves
Socio-economic Well-being	Migration, water scarcity, declining rural incomes

Heading towards Desertification

If Western Ghats forests—like Bhimgad—are degraded or streams diverted, through diversion and other infrastructure projects, the cascading impacts can accelerate desertification in North Karnataka by:

- Reducing rainfall
- Drying rivers/streams
- Depleting groundwater
- Worsening soil erosion
- Triggering land degradation cycles

Under such ecological stressors, desertification in North Karnataka can be avoided by protecting Bhimgad's evergreen forests, streams, and micro-climate which is vital to:

- Maintain rainfall and groundwater in northern districts
- Secure agrarian livelihoods
- Prevent land degeneration traps

6.5 Effect on Malaprabha Catchment and Renukasagar Reservoir

Reference NIVA report SNO 5692-2008 Hydrology and Water Allocation in Malaprabha. *(Refer Annexure V and Toposheet on Page 56)*

Impacts of Degradation of the Malaprabha catchment: 80% of Stream Flow and Ground

Water recharge in the Catchment Occurs from Zone1

The ecological damage caused by the Bhandura Nala diversion can have significant cascading effects on the Malaprabha River catchment, particularly because this catchment is located in the Western Ghats, a critical ecological zone. Impacts of degradation of the Malaprabha catchment

(i) Loss of Baseflow and Perennial Stream Support

- Bhandura Nala diversion will adversely affect the micro climate, temperature and rainfall in the very region where headwater streams such as Halatri that contribute to the Malaprabha river system *(Refer Page 56)*
- Disruption of the flows affect the subsurface groundwater recharge and reduces baseflow, especially during non-monsoon months
- This impairs year-round flow in downstream tributaries of Malaprabha, affecting irrigation, drinking water, and reservoir levels

(ii) Reduced Inflows into Renukasagar

- The Malaprabha dam (Renuka sagar) relies on inflows from high rainfall areas in Khanapur and Bhimgad
- Ecological degradation reduces runoff coefficients (more infiltration or evaporation), leading to lower reservoir inflows
- Over time, this can compromise water storage for Bagalkot, Dharwad, and Gadag, which rely heavily on this system

(iii) Vegetation and Soil Degradation in the Catchment

- Diversion construction and associated deforestation or fragmentation causes:
  - Loss of forest cover
  - Soil erosion and siltation of streams
  - Degradation of the hydrological functions of the forest
- A damaged forest loses its ability to regulate flow, recharge groundwater, and retain moisture, all vital for catchment health

(iv) Climate and Rainfall Impacts

- The Western Ghats, including Bhimgad and Khanapur, influence local and regional rainfall through orographic effects and moisture recycling
- Loss of forest in the headwater zone could reduce cloud formation and rainfall, affecting the entire Malaprabha basin

(v) Breakdown of the Biodiversity-Hydrology Link

The Malaprabha catchment supports sensitive ecosystems. Reduced stream flow and habitat fragmentation disrupt ecosystem services like pollination, seed dispersal, and natural water purification.

6.6 Effect on Proposed Beneficiary Regions

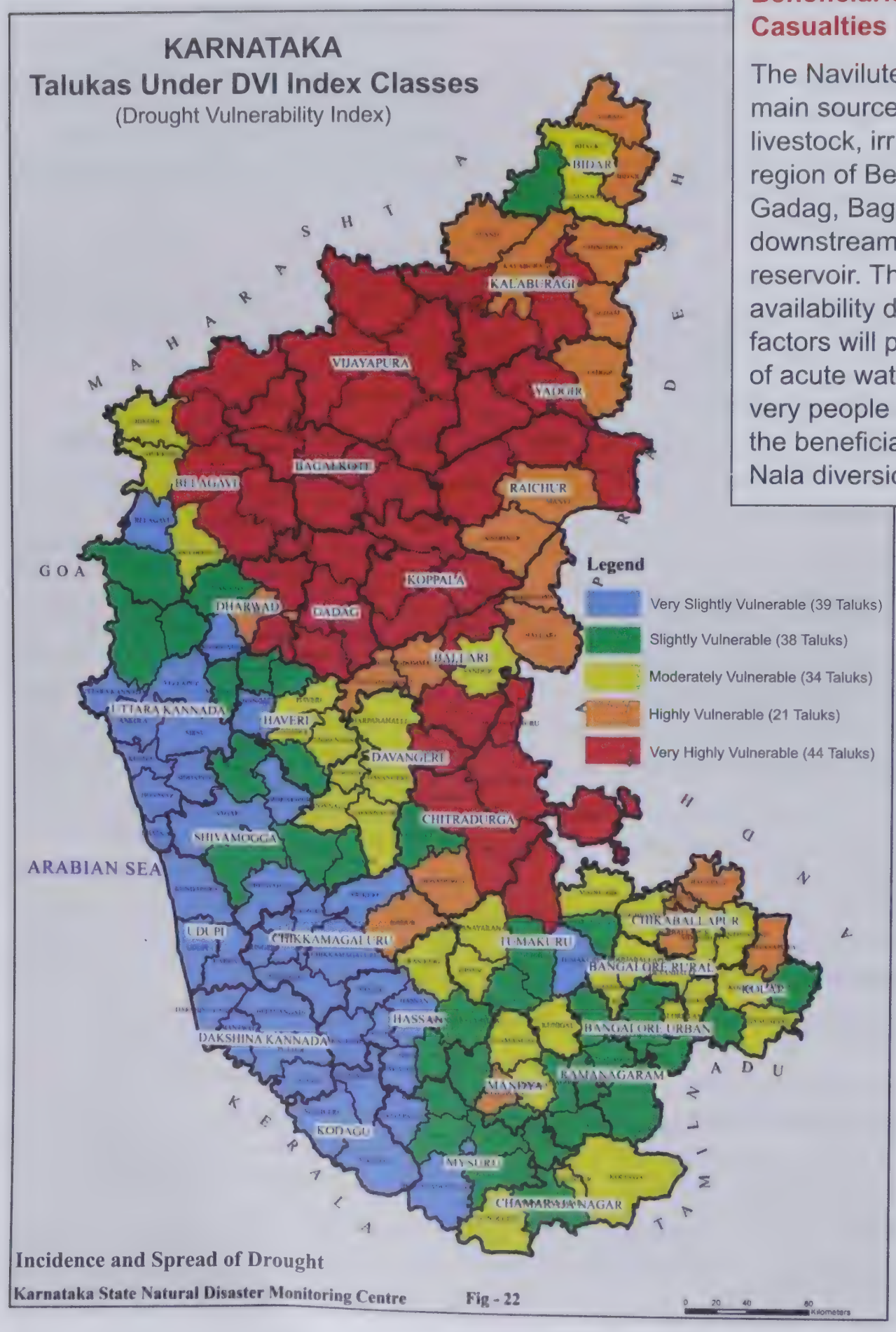
The degradation of evergreen forests in Bhimgad and the Western Ghats, due to stream diversion will have serious ecological and hydrological consequences for the proposed water beneficiary regions such as Dharwad-Hubli, Nargund, Bailhongal, etc. T*his area receives much of its rainfall due to orographic lift - 40% feed to southwest monsoon, cloud condensation nuclei, created by forested Ghats.* Additionally, they are in the rain-shadow and transitional belt of the Ghats, making them particularly vulnerable to even small shifts in forest cover and rainfall.

Location	Position Relative to Bhimgad	Ecosystem Type	Specific Impact
Dharwad	~80–100 km east	Moist–semi-arid transition	Less rainfall, drying wells, erratic kharif sowing, un-assured tank recharge
Nargund	East of Dharwad	Rainfed, dry semi-arid	Rainfed crop failure, dry spells, tank recharge failure, increased out- migration
Bailhongal	Southeast of Bhimgad	Plateau, intense agricultural activity	Stream/tank drying, groundwater stress, crop yield decline, soil erosion

If degradation of the Ghats continues, these regions, on the path towards increasing aridity and desertification pressures will be further stressed. Proactive watershed management and forest protection upstream (Bhimgad) are essential to reverse or mitigate these trends.

Scientific / Institutional References

1. Gunnell and Krishnaswamy (2003): Demonstrated that the Western Ghat forests strongly influence stream-flow and base-flow dynamics.
2. ATREE & IISc Studies: Show that headwater conservation is crucial to maintain hydrologic yield in peninsular rivers like the Malaprabha.
3. NIH-Roorkee & IISC, Bangalore, have long emphasised the connection between forest loss and declining yields in rivers originating in the Western Ghats.
4. The Desertification Atlas Published by ISRO (2021) shows early signs of degradation in eastern Dharwad and southern Bailhongal.



Incidence and Spread of Drought

Karnataka State Natural Disaster Monitoring Centre **Fig - 22**

Beneficiaries will be the largest Casualties

The Naviluteertha Dam is the main source of water for drinking, livestock, irrigation etc., for the region of Belagavi, Dharwad, Gadag, Bagalkot, and downstream and upstream of the reservoir. The reduction of water availability due to the above factors will put the region in stress of acute water shortage for the very people who are meant to be the beneficiaries of the Bhandura Nala diversion.

7. Dr S Vishwanathan's Study on Evaporation Dynamics

Dr S Viswanathan's Laboratory measurements of evaporation rates of various salts showed that higher salinity significantly reduced evaporation. NaCl (the salt in sea water) had a retardation factor of ~0.712, meaning evaporation was about 29% slower than with distilled water.

Vishwanathan's findings, now widely cited in environmental hydrology, demonstrate that:

- Saline water evaporates at a significantly slower rate compared to freshwater.
- The presence of dissolved salts like NaCl, $MgSO_4$, and KNO_3 reduces the evaporation rate by up to 29% or more
- Reduced evaporation means less water vapour enters the atmosphere, which leads to decline in local atmospheric moisture content, and **consequently, reduced precipitation.**
- This research shows a critical hydrological feedback loop between surface water chemistry and rainfall generation, especially relevant for coastal regions or closed basins.
- Since precipitation (downward moisture) relies on evaporation, high salinity effectively slows the hydrological loop, affecting soil moisture, river inflow, and even long-term climate dynamics in sensitive regions

Laboratory Findings and Climate Observations

- Laboratory findings as the above align with broader climate observations: perceptible water vapour (PWV) trends in India show strong links to surface temperature and evapotranspiration. When evaporation is hindered (e.g. by high salinity or high humidity), PWV and associated rainfall will decrease
- Marine aerosol interactions (e.g., sea-salt particles in Western Ghats monsoon clouds) influence precipitation chemistry, but not the evaporation rate directly. Salty sea-spray influences rainfall delivery

7.1 S. Viswanathan's Study on Salinity and Evaporation in the Context of Mahadayi River Diversion and its Impact on North Karnataka

The diversion of Kalasa and Bandura, the headwater tributaries of the Mahadayi (Mandovi) by Karnataka state has raised significant ecological, hydrological, and climatic concerns. While the primary intent of the diversion is to augment drinking water and supply for agriculture in North Karnataka, a growing body of evidence suggests that such a diversion may have counterproductive long-term effects, particularly by altering local and regional climate feedback systems.

(i) Impact on North Karnataka: The Desertification Threat

While the diversion aims to supply more water to North Karnataka, it may accelerate desertification in the region due to long-term climate feedbacks:

- North Karnataka lies in the rain shadow of the Western Ghats. It depends on monsoon convection over the Ghats, which is partially fuelled by coastal and estuarine evaporation.
- Reduced rainfall over the Ghats due to diminished evaporation (from increased estuarine salinity) leads to declining recharge in Malaprabha, Ghataprabha, and Krishna tributaries.
- Dryland farming systems in Belagavi, Dharwad, Gadag, Bagalkot, and parts of Vijayapura face lower soil moisture, increased crop failure, and rising groundwater stress.
- This can result in accelerated desertification and agro-ecological collapse in parts of the Deccan Plateau.

(ii) Link to Mahadayi River and Goa's Estuarine Dynamics

The Mahadayi River plays a crucial role in maintaining the freshwater–saltwater balance in Goa's estuaries. Freshwater discharge from the river

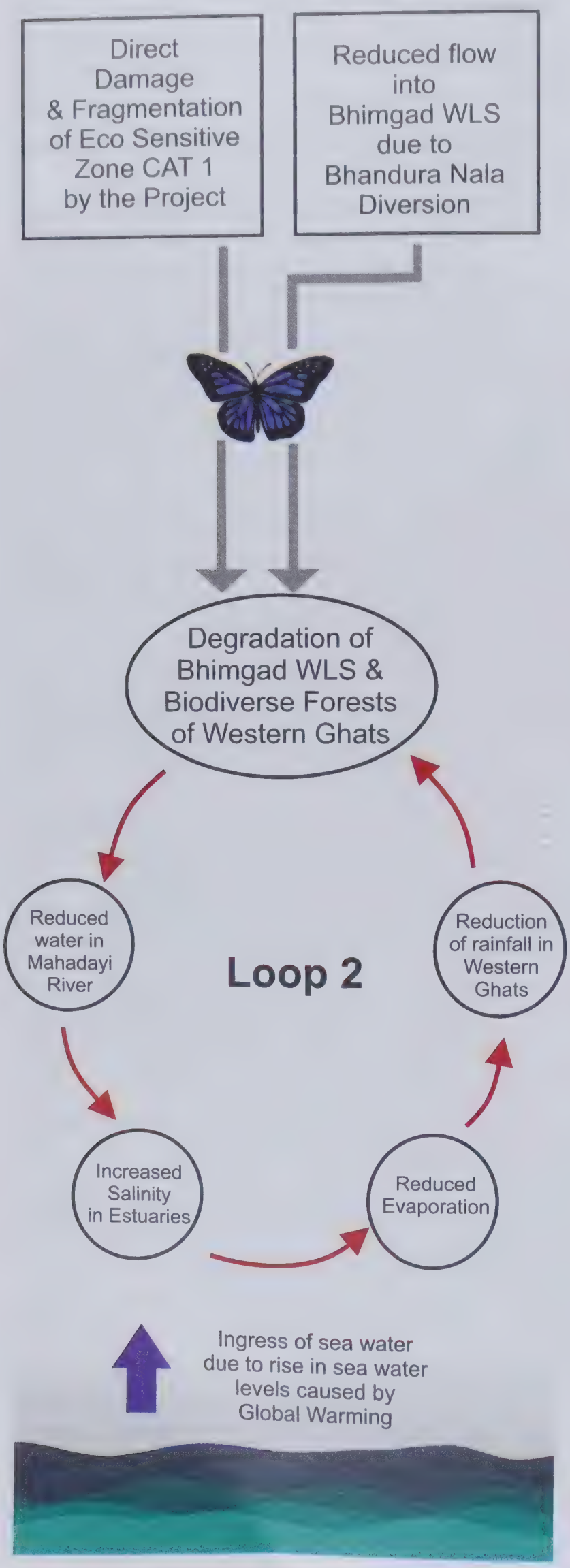
- Prevents saline intrusion from the Arabian Sea
- Maintains brackish water balance necessary for local ecosystems and evaporation cycle
- Supports coastal convection through evaporative moisture from estuarine and riparian zones

With the diversion of Mahadayi water upstream in Karnataka, freshwater flow to Goa decreases, causing:

- Higher salinity levels in estuarine zones and shallow aquifers

Self Reinforcing Desertification Loops

Initiated by Diversion of Bhandura Nala the Headwater Stream of Bhimgad WLS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Degradation of Bhimgad WLS & Biodiverse Forests of Western Ghats
Reduction of rainfall in Western Ghats
Reduced Evaporation
Increased Salinity in Estuaries
Reduced water in Mahadayi River
Loop 2
Ingress of sea water due to rise in sea water levels caused by Global Warming

- Lower surface evaporation from saline water bodies (as per Viswanathan's findings),
- Reduced coastal humidity and lower monsoonal convection
- Weakened rainfall recharge inland.

S. Viswanathan's study provides scientific validation that altering the salinity dynamics of river systems has far-reaching consequences on the hydrological cycle.

With the process of Global Warming causing increase in sea levels, the Mandovi estuaries face a clear and imminent increase in salinity. This will further boost increase in salinity through the desertification loop. It is prudent and imperative to let the rivers flow unabated to mitigate the increase in salinity due to sea level rise caused by global warming. Thus aiding to create more fresh water and maintain the perenniality of the river and headwater stream.

In the case of Mahadayi, the upstream diversion will increase estuarine salinity and reduce evaporation. Thus weakening rainfall over both the coastal regions and the rain-shadowed interiors of North Karnataka. This in turn will undermine the very water security goals the diversion seeks to achieve.

Thus, the diversion of Mahadayi water must be reconsidered not just for its legal or ecological consequences, but for the regional climate destabilisation and desertification it could cause, especially in North Karnataka.

8. El Niño Effect and the Role of Western Ghats in Buffering Drought

El Niño Effect on Indian Monsoon & Droughts

El Niño is the warming of sea surface temperatures in the central and eastern Pacific Ocean. It disrupts global weather patterns — especially the Indian monsoon.

Impact	Description
Weakened monsoon	El Niño suppresses convection in the Indian Ocean, weakening the Southwest monsoon
Rainfall deficit	Rainfall over India, especially central and peninsular regions, can fall below normal (20-30% deficit)
Drought trigger	Many past drought years in India (e.g. 2002, 2009, 2015) were El Niño years

9.1 Destruction of Western Ghats Worsens Drought (esp. in El Niño years)

- Reduces orographic rain efficiency leading to less rainfall in Malnad and adjoining plains
- Lowers baseflows to rivers like Malaprabha, Ghataprabha, and Mahadayi
- Destroys moisture-recycling forest systems resulting in drier local climate
- Shifts rain patterns eastward, leading to "dry shadows" over districts like Belagavi, Dharwad, and Bagalkot
- The effects on North Karnataka during El Nino combined with deforestation could be
  - Less rainfall over Bhimgad and Khanapur
  - Fall in the Malaprabha river inflow
  - Impact on Renukasagar reservoir
  - Agricultural drought in rain-fed areas of Belagavi, Dharwad and North Karnataka.

9.2 Role of Western Ghats in Moderating Drought

The Western Ghats act as a climate buffer and moisture generator, especially during El Niño and poor monsoon years.

Mechanism	Role
Orographic rainfall	Winds from the Arabian Sea rise over the Ghats and drop heavy rain on the windward side, ensuring water availability even during weak monsoons.
Moisture recycling	Forests of the Ghats transpire water vapour into the atmosphere, increasing local humidity and triggering convection/rain.
Perennial river source	The Ghats are source regions for rivers like Malaprabha and Mahadayi; they help sustain baseflows during dry periods.
Cloud formation	The rugged topography traps clouds longer, enhancing localised rainfall.
Refugia for biodiversity and microclimates	These forests create cool, humid refuges that stabilise ecosystems under climate stress.

Following are some select scientific documents and studies that support the link between El Niño, drought in peninsular India, and the ecological role of the Western Ghats in moderating monsoon variability and desertification

(i) El Nino

1. "El Niño and Indian Droughts – A Scourge Revisited"

   The above article by B N Goswami of Indian Institute of Tropical Meteorology (IITM), Pune

published in Current Science, 2004, shows a strong statistical link between El Niño years and droughts in central & peninsular India, including Karnataka

2. "ENSO-Monsoon Relationship and Indian Droughts"

   As per Rupa Kumar et al. (IMD, Pune) published in Climate Dynamics, El Niño weakens the Hadley cell and Walker circulation, reducing convection over the Indian Ocean and causing drought conditions.

(ii) Western Ghats and their Role in Rainfall, Drought Buffering

3. Western Ghats Ecology Expert Panel (WGEEP) Report 2011

   Published by MoEF & CC

   The Gadgil Committee makes a point that the Ghats are crucial for climate regulation, water yield, and monsoon stability. Their destruction will lead to decline in moisture recycling, droughts, and river flow depletion. The report makes a specific mention of Belagavi, Khanapur, and Mahadayi region for its ecological sensitivity.

4. Evapotranspiration and Forest Influence on Rainfall

   Dr. S. Vishwanath of Biome, Rainwater Club, points out that forests act as rain factories, contributing up to 30% of local rainfall through transpiration. Destruction of Western Ghats reduces cloud formation and local rainfall.

5. "Water Yield from Western Ghats Forests" N. V. Joshi & R. Sukumar in the Journal of Hydrology point out that the forested Ghats produce higher baseflows and sustained dry-season flow. Their degradation will affect rivers like Malaprabha and Mahadayi.

   ISRO & NRSC Remote Sensing Studies

(iii) Desertification and Land Degradation Atlas of India (ISRO 2021)

6. ISRO's Desertification Atlas for Karnataka, NRSC (ISRO)

   The land degradation and land use maps for "Desertification risk due to forest loss and climate variability" for Karnataka including northern parts of Karnataka as well as district wise for Belagavi, Bagalkot, Dharwad etc., are available for perusal on the NRSC's Bhuvan web portal

(iv) Legal & Policy Support

7. National Action Plan on Climate Change (NAPCC)

   Calls for conservation of ecological hotspots (like Western Ghats) to mitigate climate variability & drought.

8. India's National Biodiversity Action Plan (NBAP, 2014 addendum to NBAP, 2008)

   Recognizes Western Ghats as climate stabilizers, and urges protection from diversion projects.

9. Western Ghats as UNESCO World Heritage and Biodiversity Hotspot

The Western Ghats is a designated UNESCO World Heritage Site and Biodiversity Hotspot. This is of global ecological and conservation significance.

(i) Global Recognition for Biodiversity

- The Western Ghats is one of only 36 global biodiversity hotspots
- It hosts:
  - Over 7,400 species of plants and animals
  - 325 globally threatened species (IUCN Red List)
  - *High endemism:* Over 50% of tree species and 65% of amphibians are found nowhere else on Earth.

(ii) World Heritage Site (UNESCO) Status

- Declared in 2012 as a serial World Heritage Site comprising 39 forested sites across Kerala, Karnataka, Tamil Nadu, and Maharashtra
- Recognized for its outstanding universal value (OUV) in terms of:
  - Ecological integrity
  - Evolutionary history
  - Ecosystem services

(iii) Hydrological and Climatic Role

- "Water Tower" of Peninsular India:
  - Origin of major rivers: Godavari, Krishna, Cauvery, Malaprabha, Mahadayi, etc.
  - Maintains monsoon dynamics, cloud formation and rainfall cycles
- Ensures eco-flows, groundwater recharge, and supports millions of downstream livelihoods

(iv) Climate Regulation

Dense forests act as carbon sinks, absorbing atmospheri CO_2

- Help regulate regional temperature and moisture, critical for agriculture in Deccan Plateau and Karnataka's semi-arid belts

(v) Legal and Conservation Benefits

- UNESCO tag strengthens legal protection under:
  - Wildlife Protection Act, 1972
  - Forest Conservation Act, 1980
  - Environment (Protection) Act, 1986
- Provides a perspective on ecologically damaging projects in and around heritage zones (like mining, large dams, deforestation, etc.)

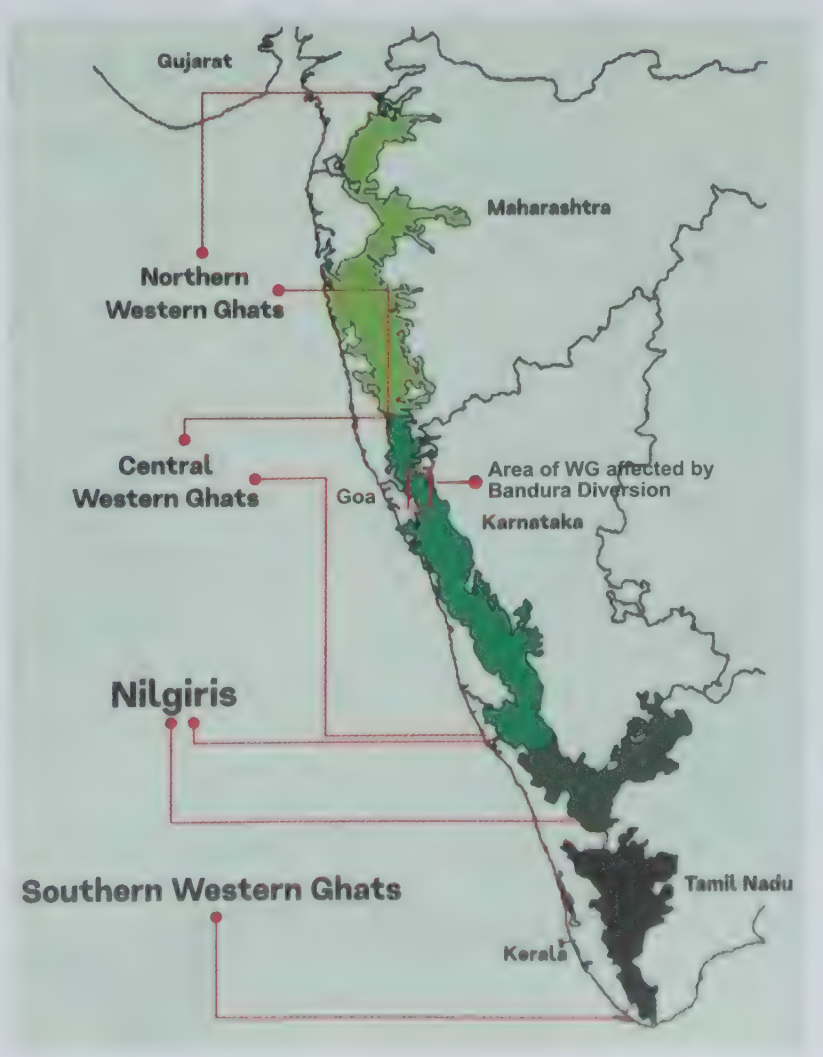
(vi) Buffer against Desertification

- Protected forested slopes prevent:
  - Soil erosion
  - Drying of rivers
  - Loss of monsoon moisture inland
- Regional Western Ghat forests, when conserved and protected, act as a barrier to aridification of interior regions of North Karnataka, Telangana, and Rayalaseema.

(vii) Cultural and Indigenous Value

- Sacred groves and traditional medicine are deeply interconnected
- Eco-friendly agro-ecological practices are deeply rooted in the cultural traditions of resident communities of the Ghats
- Protecting the Ghats also preserves indigenous knowledge systems and sustainable land use patterns

Western Ghats of India



3 Self Reinforcing

Direct Damage & Fragmentation of Eco Sensitive Zone CAT 1 by the Project

Reduced flow into Bhimgad WLS due to Bhandura Nala Diversion

Degradation of Bhimgad WLS & Biodiverse Forests of Western Ghats

Reduction of rainfall in North Karnataka

Loop 1

Reduced rain in Bhimgad WLS

Further drying of Bhimgad WLS

Reduced Evaporation & Transpiration

Reduction of Rain in Western Ghats

Loop 2

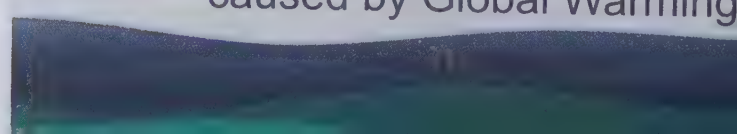
Reduced water in Mahadayi River

Increased Salinity in Estuaries

Reduced Evaporation

Reduction of rain in Western Ghats

Ingress of sea water due to rise in sea water lev caused by Global Warming



Desertification Loops

Dry & Wet Desertification in Malaprabha Basin & N.Karnataka

Reduction of rainfall in headwater springs of Malaphrabha and tributaries

Reduced Water in Malaprabha Basin

Over extraction of Groundwater

Wet Desertification in Malaprabha Basin

Increased Salinity in the Basin

Reduced Evaporation

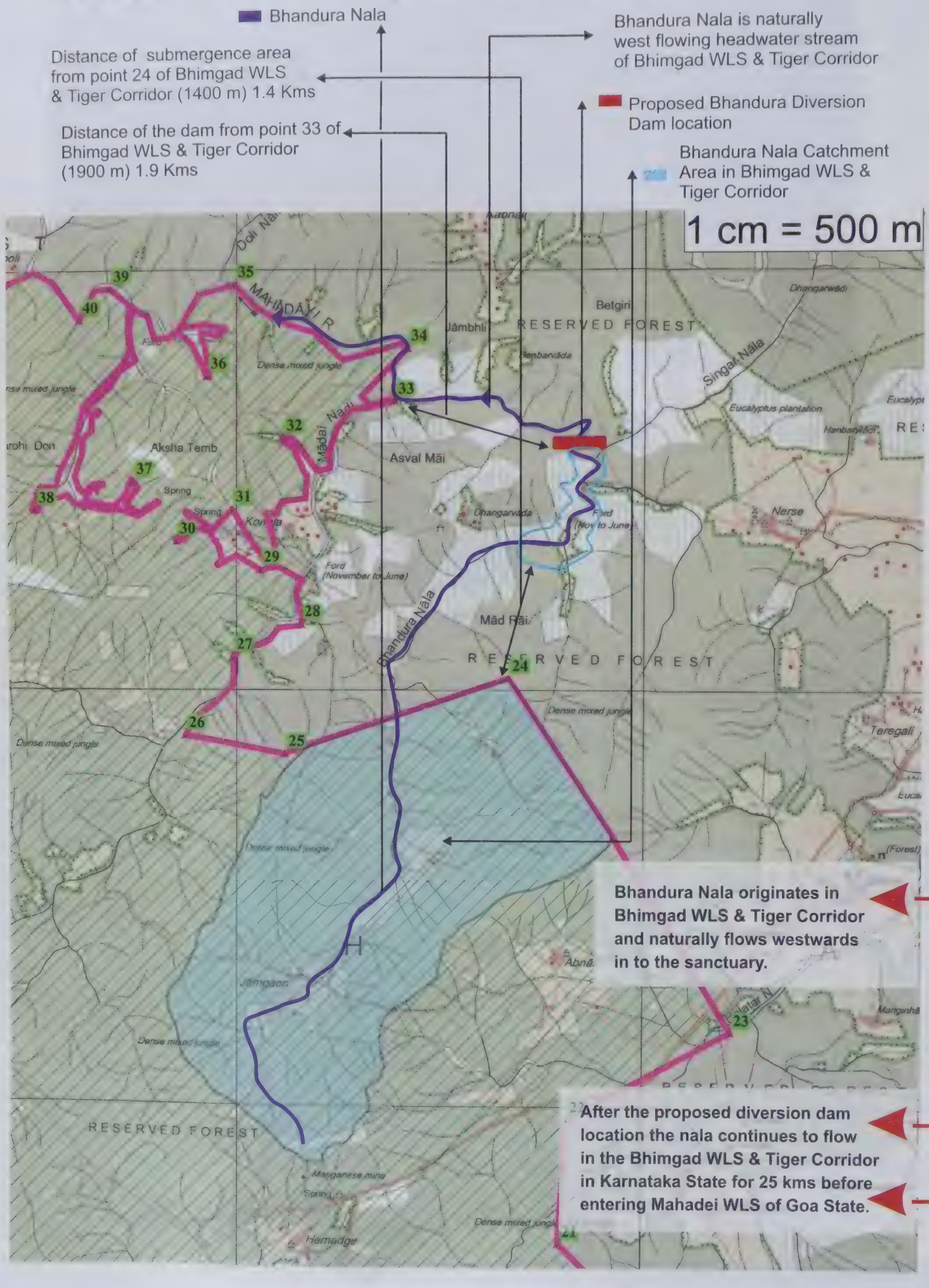
Reduced Rainfall

Loop 3

Butterfly Effect

(Refer Annexure III)

Location of Proposed Bhandura Nala Diversion Project & its Catchment and Submergence Area with Respect to Bhimgad WLS



11. Violation of Regulations

Objectives of Section 29 of Wildlife Protection Act Prevent Commercial or Human-Centric Use

- Section 29 ensures that the primary use of sanctuary land remains for wildlife only.
- Any diversion usually serves human interests (e.g., drinking water, irrigation, tourism infrastructure), which often comes at the cost of wildlife needs.
- The law shifts the burden of proof: the government or user agency must prove that diversion is necessary for wildlife, not just for people.

To Stop Irreversible Ecological Damage

- Forest ecosystems are interdependent systems—removing trees, altering water flows, or constructing structures disturbs:
  - Soil stability
  - Micro-climates
  - Aquifers
  - Biodiversity food chains
- Such damage is often irreversible and can lead to desertification, invasive species proliferation, and forest fires.

To Enforce Scientific, Controlled Use of Resources

- Section 29 doesn't ban all activity—it allows for use only if:
  - It helps in the improvement or better management of wildlife, and
  - It has been scientifically evaluated and approved by the Chief Wildlife Warden (and the NBWL).

11.1 Bhandura Diversion Contravenes Section 29 of the Wildlife Protection Act

Refer to the topographic sheet on page showing Bhandura Diversion Dam w.r.t. Bhimgad Wildlife sanctuary.

Bhandura Nala originates in Bhimgad WLS and large area of its catchment is within the WLS.

Bhandura Nala naturally flows in the wildlife sanctuary. The location of the dam is only 1.9 kms from the boundary of the wildlife sanctuary and diverts 91% flow away from the sanctuary.

This is a clear violation of Section 29 of Wildlife Protection Act.

Bhandura Nala diversion violates Environment (Protection) Act, 1986 and the EIA Notification, 2006 (as amended) issued by the Ministry of Environment, Forest and Climate Change (MoEF&CC).

11.2 EIA is required when a Project is Located in or Near Sensitive Zones

Even if a project is small, it requires Environment Impact Assessment if: Within 10 km of:

- Wildlife Sanctuary
- National Park
- Tiger Corridor
- Eco-sensitive Zone (ESZ)

- Within a notified forest area or wetland
- In the Western Ghats (as per HLWG/Gadgil report recommendations)

Such projects need clearance from the State or National Wildlife Board

The Bhandura Diversion project and the land required for diversion is located less than 2 kms from the Bhimgad Wildlife Sanctuary and the Tiger Corridor

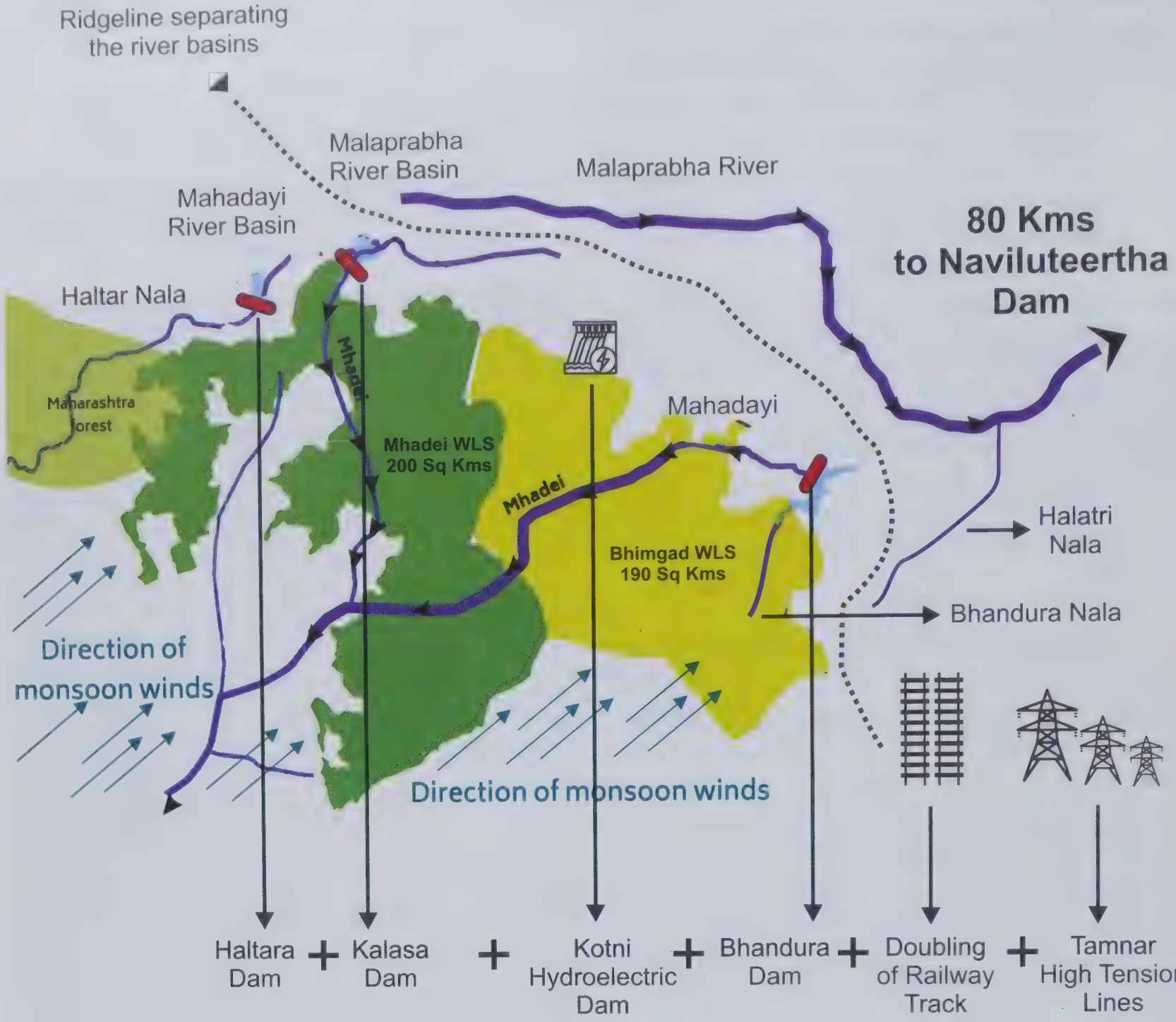
The CWC approved DPR wrongly States that EIA is not applicable.

A False statement is made By Deputy Conservator of Forest, Belagavi in Form A part II in Parivesh portal in case FP/KA/WATER/460216/2024 that there is no Wildlife Sanctuary or Tiger Corridor within 10 kms of the land that is required to be diverted for the project.

The topographic sheet on pg. no. clearly shows that the Bhimgad WLS and the Tiger Corridor is within 2 kms of the land to be diverted for the project.

The falsifying of information indicate that there is malafide interest of the Karnataka Niravari Nigam Limited and Forest Department in implementing the diversion project

12. Effects of Bhandura Nala Diversion Should not be seen in Isolation



= Irreversible Ecological Disaster

Bhandura Nala diversion is part of Kalasa Bhandura Mahadayi diversion Project.

Kalasa Diversion will adversely affect the Mhadei WLS in same manner as Bhandura Nala diversion affects the Bhimgad WLS.

Although Mhadei WLS is not in Karnataka it is adjacent to parts of Belagavi district in the same manner as Belagavi District is adjacent to Bhimgad WLS.

Any effect on the forests of Mhadei WLS will contribute more negative impacts towards desertification of North Karnataka than the forests of Bhimgad WLS. This is because it is adjoining to the Malaprabha river origin, the prime headwaters of Malaprabha; and, adjoins to the Malaprabha Basin.

Kotni Project, awarded by the Tribunal (MWDT) will have similar effects. So also will the doubling of railway lines and the Tamnar Power Lines.

The cumulative ecological footprint of Kalasa, Bhandura, Kotni, Mollem rail expansion, and Goa-Tamnar power line:

- Will degrade primary forests, dry headwater streams, and fragment critical corridors
- Risks triggering regional-scale rainfall decline and desertification across Karnataka's rainfed zones
- Will breach the ecological thresholds for the Western Ghats

Irreversible damage and cumulative impacts of the projects will push **North Karnataka desertification into a Runaway Train**

13. Bhandura Diversion Contradicts the Objectives of Jal Jeevan Mission (JJM)

Although Bhandura Nala Diversion contradicts all the objectives of J. J. M., the Government of Karnataka is pushing the project falsely by claiming the project under J. J. M.; thus taking refuge to justify Diversion.

The Mahadayi (Mandovi) River, originating in the Western Ghats of Karnataka, is a west-flowing river critical to the ecology and economy of Goa. Karnataka proposes to divert 3.9 TMC of water from its tributaries (Kalasa, Bhandura, Haltara) into the Malaprabha basin, citing drinking water needs under the Jal Jeevan Mission (JJM).

The Jal Jeevan Mission, launched in August 2019, by the ministry of Jal Shakti aims to provide functional household tap connections (FHTC) to all rural households by 2024. Its emphasis is on local and sustainable water resource, village level planning through active community, source strengthening, and prioritisation of water-scarce and quality-affected areas.

The Mahadayi Diversion is a project of the Government of Karnataka, to be implemented by the Karnataka Niravari Nigam Limited. The project sites are the headwater spring-streams –Kalasa, Bhandura, and Haltara –in the Western Ghats of Belagavi district. The project proposes to divert 3.9 TMC of water from the Mahadayi river (Mandovi)—a west-flowing river—to the Malaprabha basin, which is in the Krishna basin (east-flowing).

The stated goal is to augment the drinking water supply in Hubali-Dharwad and surrounding towns. A goal that Karnataka aligns with the JJM narrative. The Mahadayi Diversion Project and the Jal Jeevan Mission (JJM) are both water-related initiatives. However, their objectives and implications differ greatly.

Mahadayi diversion does not align with the JJM's ethos of local water source management, sustainable community-managed water solutions. *(Refer Annexure VII)*

13.1 Serious Contradictions

JJM vs Mahadayi Diversion: A Conflict

Parameter	Jal Jeevan Mission (JJM)	Mahadayi Diversion Project
Goal	Decentralised, local, sustainable drinking water	Large-scale inter-basin transfer
Source	Local aquifers, springs, rainwater harvesting	River diversion from ecologically sensitive Western Ghats
Impact on Ecology	Promotes sustainability	Threatens Bhimgad & Mahadayi Wildlife Sanctuaries (UNESCO eco-region)
Beneficiaries	Rural households in-situ	Largely urban areas (e.g., Hubali-
Mode	Village-level aquifer recharge, piped supply	High-cost, high-impact diversion through forest area

(i) Mahadayi Diversion is at odds with JJM

- Ecological Damage vs Source Protection
  - ➢ JJM stresses source sustainability; diversion risks deforestation, salinity changes, and rainfall disruption in the Western Ghats
  - ➢ Violates the principles of catchment integrity that JJM upholds
- Rural Bias of JJM vs Urban Demand of Diversion
  - ➢ JJM targets rural homes; Kalasa-Bhandura will mainly benefit urban belts, with downstream use for agriculture and sugarcane in Malaprabha basin.
- Ignored Alternatives
  - ➢ Groundwater recharge in Malaprabha basin, desilting of Naviluteertha Dam, and harnessing Bennihalla & other tributaries could yield much larger water quantities with less damage.

(ii) The Correct JJM-Compliant Approach for North Karnataka would be to:

- Harness Bennihalla, (local option)
- Mandate rainwater harvesting in public buildings and farmlands
- Desilting of Naviluteertha Dam to regain 12 TMC of storage lost to silt
- Adopt water saving sugarcane cultivation practices such as drip irrigation and organic practices (saves >50 TMC water)

- Shift from sugarcane to millets in Malaprabha basin (saves >50 TMC water)
- Micro-irrigation and aquifer mapping for long-term sustainability

The Mahadayi Diversion Project, though framed as a drinking water solution, fundamentally contradicts the Jal Jeevan Mission's principles of sustainability, local water source management, and ecological sensitivity. Instead of massive ecological disruption, the state should explore in-basin alternatives like Bennihalla harnessing, desilting, and groundwater recharge—aligned with the JJM's long-term rural water security goals.

Mahadayi Diversion vs JJM: Principles and Practice

JJM Principle	Mahadayi Diversion Practice
Source sustainability	Damages Western Ghats forests; disrupts monsoon-regenerating ecosystems
Local water management	Relies on inter-basin transfer from eco-sensitive forest zones
Rural focus	Serves urban centres (Hubli-Dharwad) and indirectly sugarcane cultivation
Community-led planning	Top-down project; limited Gram Panchayat participation
Sustainable infrastructure	Ecologically high-cost diversion through wildlife sanctuaries

Har Ghar Jal
Jal Jeevan Mission

(iii) Ecological & Legal Concerns

- Protected Areas Affected: Bhimgad and Mahadayi Wildlife Sanctuaries (UNESCO-tagged eco-sensitive zone)
- Tribunal Constraints: The Mahadayi Water Disputes Tribunal has limited Karnataka's use; project legality remains contested
- Environmental Impact: Diversion may disrupt rainfall, increase estuarine salinity , and cause desertification in parts of North Karnataka

JJM-Compliant Alternatives for Drinking Water Supply

Option	Estimated Yield (TMC)	Benefits
Desilt Naviluteertha Reservoir	6-8 TMC	Low-cost, immediate storage recovery
Harness Bennihalla River	2.0–3.0 TMC 1.0–2.0 TMC/year	Local source, avoids diversion Long-term rural water resilience
Crop shift from sugarcane	Saves >50 TMC	Addresses root cause of overuse by sugarcane
Use of Drip Irrigation and Organic Practices for Sugarcane cultivation	Saves >50 TMC	Addresses root cause of overuse
Rooftop & farm rainwater harvesting	0.5–1.0 TMC	Distributed, low-infrastructure approach

(iv) To Align with Jal Jeevan Mission the Government of Karnataka should:

1. Reject Mahadayi diversion as a drinking water solution under JJM. It contradicts the mission's sustainability and equity goals
2. Commission hydrological feasibility studies for Bennihalla, Hirehalla, and tributary harnessing
3. Immediately initiate desilting of Naviluteertha Dam to recover lost capacity
4. Promote community-based watershed programs with support from MGNREGA and Atal Bhujal Yojana.
5. Shift cropping patterns through policy incentives to reduce sugarcane water footprint.

A Fact

The Mahadayi Diversion Project, under the guise of fulfilling JJM goals, poses significant ecological, legal, and ethical challenges. The government can meet the drinking water needs sustainably by adopting in-basin, JJM-aligned solutions that ensure long-term water security without causing irreparable ecological harm.

14. The Yettinahole Debacle

(A case parallel to Bhandura Diversion)

(i) Gross Overestimation of Water Availability

- State claim: Project designed to divert ~24.1 TMC (thousand million cubic feet) from Yettinahole
- Reality check: Independent studies by IISc estimate actual annual yield at only ~9.55 TMC—less than half of what was claimed
  - ➢ Of which, ~5.84 TMC required for local use and ~2.84 TMC to remain as ecological flow
  - ➢ Most of the flow gets used locally, leaving next to nothing to divert eastward.

(ii) Threat to Biodiverse Western Ghats

- The project cuts through eco-sensitive areas (Western Ghats ESZ-1), removing hundreds of acres of forests for canals, roads, pump stations, and power lines
- This deforestation fragments habitats, disrupts wildlife corridors (notably for elephants), and heightens landslide and human-wildlife conflict risks

(iii) Touted as Weak or No Environmental Impact

- Despite involving storage and non-drinking uses (~40%), project was officially framed as "drinking water" to bypass EIA/ forest-clearance laws
- As a result, the Forest Department and MoEF&CC monitored operations, but no full environmental clearance was sought
- National Green Tribunal echoed this—and upheld the drinking-water exemption drawing criticism that the exemption was misused

(i) Legal Pressure & Halt Orders

- Activists brought three cases before the NGT; all were dismissed on technical grounds (use-case exemption)
- However, a Central panel recently intervened: it halted new work and demanded accountability for officials involved in unauthorized de-forestation and blasting activities

(v) Risks to Local Communities & Coastal Areas

- Downstream coastal communities (e.g. Dakshina Kannada) report reduced river flows and increased seasonal drought due to upstream diversion
- Farmers and villagers along the Netravathi have raised concerns that drying watercourses threaten local ecology, agriculture, and drinking water supply

In essence, the Yettinahole project suffers from a flawed technical premise, questionable legal framing, significant ecological damage, and inadequate safeguards—leading to its status as a major eco-flow failure.

Issue	Description
Hydrology	Real yield (~9.5 TMC) far lower than claimed (24.1 TMC)
Legal & Approval Gaps	Drinking-water exemption misused to skip environmental clearances
Ecological Impact	Forest loss, habitat fragmentation, threats to endemic and endangered species
Downstream Effects	Reduced flow hurting coastal ecosystems and local water users
Accountability	Central intervention to halt work and consider official accountability

13.1 Water Supply: Promises vs Reality

The Yettinahole (Netravathi Diversion) Project was originally conceived to supply drinking water to arid districts of central and eastern Karnataka—like Chikkaballapur, Tumakuru, Kolar, Ramanagara, and parts of Bengaluru Rural. However, the actual impact on Peninsular Central Karnataka has been very different from what was promised.

- Chikkaballapur and Kolar: Still facing water scarcity; groundwater levels continue to fall.
- Tumakuru & Bengaluru Rural: Infrastructure built, but supply is inconsistent due to poor yield

'Water-starved regions remain water-starved', while massive funds (~₹17,147 crore+) were spent. An additional 8,000 crores is required to complete the project.

Claims V/s Reality

Parameter	Claimed	Reality
Water diverted from Yettinahole	~24.1 TMC	~5–9 TMC available (per IISc studies)
Water promised to districts	7–10 TMC each	Often only 1–2 TMC available, or delayed
Districts to benefit	7–9 districts	Only 2–3 receive limited water so far

(i) No Improvement in Rainfall or Groundwater Recharge

- The project diverts water through pipelines, without allowing it to percolate and recharge aquifers
- Without forest-based watershed management or recharge zones, groundwater remains overexploited in many talukas
- Rainfall patterns continue to worsen due to deforestation in Western Ghats—reducing monsoon penetration into the interior

(ii) Indirect Negative Effects via Loss of Western Ghats

- Yettinahole's damage to Western Ghats forest cover has reduced the orographic rainfall effect, impacting the rain-shadow regions of central Karnataka
- Bhimgad–Pushpagiri corridor degradation could further weaken the "moisture pump" mechanism feeding peninsular interior rains
- Ecosystem services lost from forest destruction (carbon sequestration, humidity regulation, etc.) have long-term climate impacts

(iii) Infrastructure without Water

- Crores were spent laying pipelines, pump houses, and storage tanks across dry talukas
- These districts now have "dry pipes" or "dead-end taps" with no water
- Local resentment is growing over "pipe politics"—promises made without hydrological backing

13.2 Economic Impact on Agriculture

- Farmers who were told irrigation water would arrive planted water-intensive crops
- Crops failed, leading to debt, migration, and unrest
- Drought-prone talukas like Pavagada, Gowribidanur and Shidlaghatta remain dependent on borewells, many of which have gone dry

Yettinahole Project Effect on Central Karnataka

Impact Area	Effect
Water Security	Minimal improvement, often worse than before
Groundwater Recharge	Negligible, no aquifer recharge strategy
Rainfall	No gain; worsened due to deforestation
Agriculture	Crop failures, economic losses
Ecology	Loss of Ghats degraded monsoon system & ecosystem services
Trust in Governance	Erosion of public trust due to failed promises

Prof. T.V. Ramachandra (IISc)

"Yettinahole is a classic case of politically-driven engineering without ecological sense. It fails the local ecology and fails the thirsty people it claims to serve."

PART II

Bhandura Diversion

A Trajectory to Desertification of Malaprabha and North Karnataka

1. Mahadayi Diversion will Catapult the Desertification Trajectory

Since the commissioning of he Naviluteertha Dam in 1974, the race for sugar cultivation and installation of sugar factories progressed unchecked. Such expansion of a water guzzling crop in semi arid and humid zone, coupled with deforestation in the catchment and basin areas of River Malaprabha has initiated and intensified the desertification of the region.

2008 - 1st warning - NIVA Report *(Refer Annexure V)*

Without taking heed of the 2008 NIVA Report, expansion and additional establishment of sugar industry continued. This used up all the ground water and available surface water runoff (usable water yield), and the gap between usable water continued increasing, pushing the region to semi humid and arid status. As per ISRO report, the geo-spatial images are self-evident of this trend.

2023 - 2nd warning - IISc Report *(Refer Annexure VI)*

The IISc 2023 report based on data of 2021, issued a warning as to how degradation of forest area in the river catchments has drastically reduced the water holding power; adversely impacting the perrineality of the river. Report also points out rise in temperature and reduced ground water infiltration in the basins. It also points out the risk of acute water scarcity developing in the region.

Also not taking heed of this 2nd warning, sugarcane cultivation expansion, and risk in number of sugar factories continues exceeding the demand over the usable water yield plus the reserves of Naviluteertha dam. This indicates excessive and rapid increase in extraction of fossil water being drawn to meet the sugarcane cultivation demand. The trend is evident from the number of proposed sugar factories in the pipeline.

The final catapulting trigger in the present situation indicates that the only life support and availability of water in the Malaprabha depends on headwater springs of the river on the extreme western region of zone 1 adjoining Bhimgad and Mhadei wildlife sanctuary *(Refer Page 56)*.

The damage of this forest due to fragmentation and construction of the dams and diverting 99% of the flow away from the sanctuaries will be the final push on the trajectory of desertification *(Refer Page 21)*.

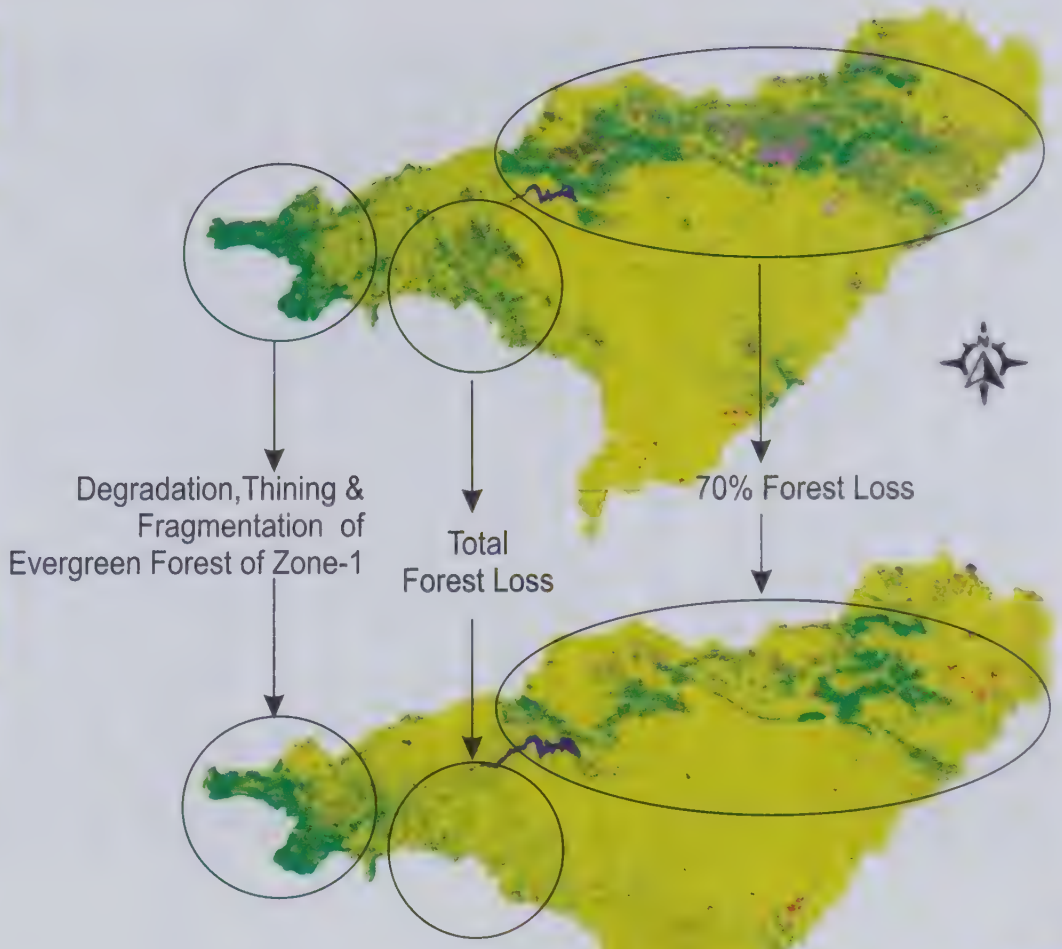
The pages that follow show facts, figures, graphs and data establishing this trajectory

1972

2018

2018

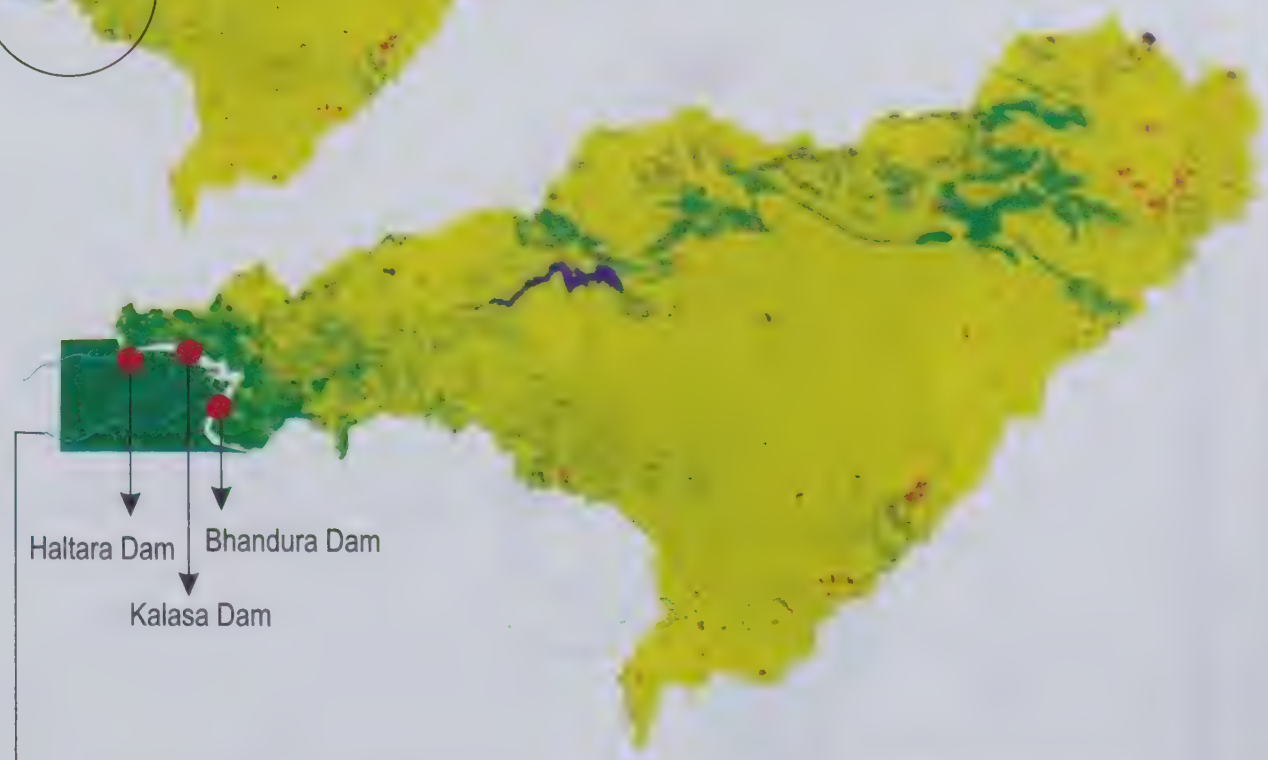
Saviours of Malaprabha, Bhimgad & Mhadei WLS



Forest degradation has created massive drop in ground water recharge rate, increase in temperature and evaporation of the basin.

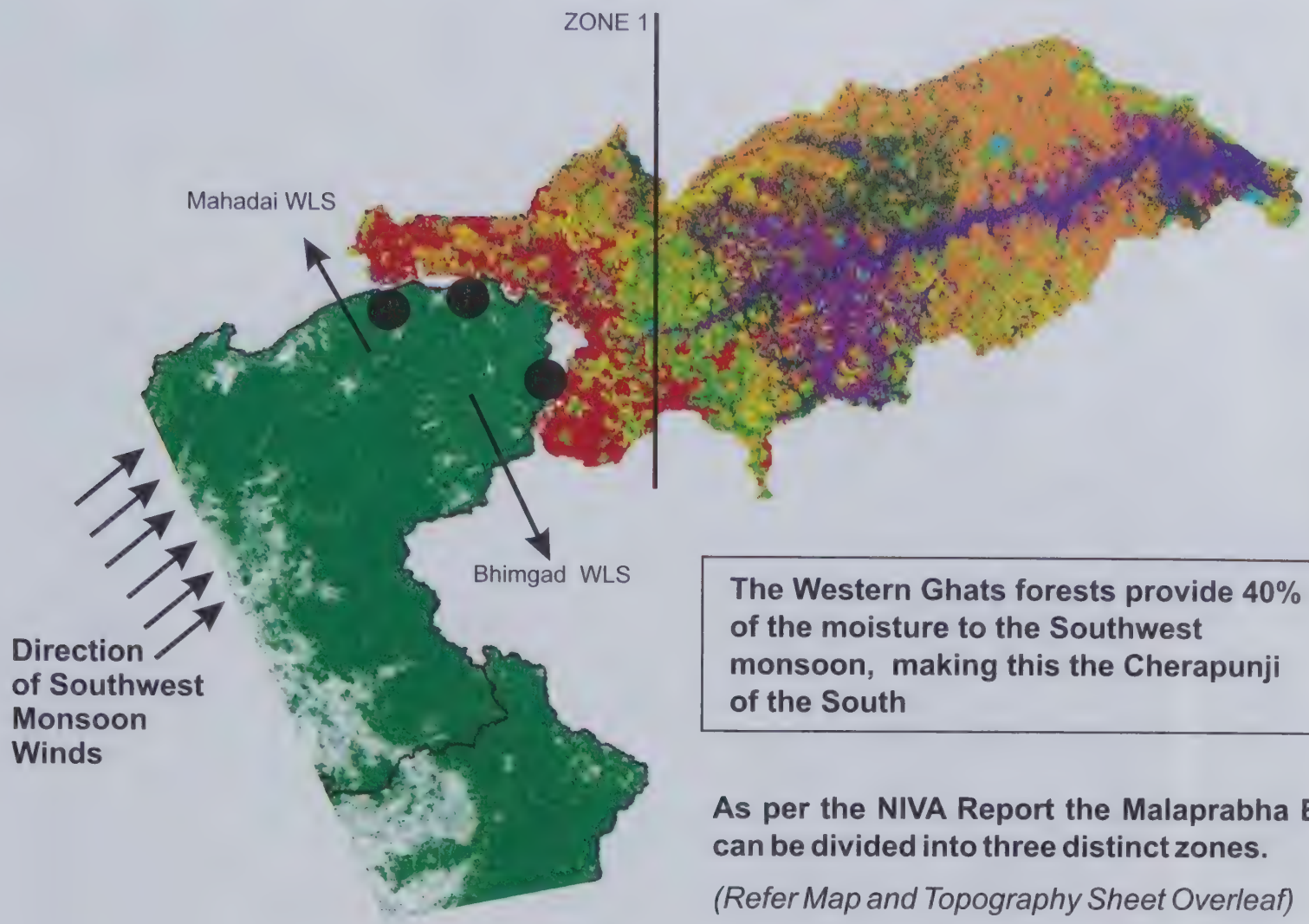
The Zone1 forest creates 80% water-flow. These forests are considerably degraded and fragmented.

The only saviour are the protected areas of Bhimgad and Mhadei WLS that are intact. These are the rain making forests adjoining Zone-1, threatened by Kalasa Bhandura Dams & Diversion



Mahadayi the Lifeline of Bhimgad & Mhadei Wildlife Sanctuaries. The only Prestine Bio-diverse forest remaing to create water for Malaprabha River

Zone 1 of Malaprabha Basin with respect to Bhimgad and Mhadei wildlife sanctuaries and Location of Diversion Dams

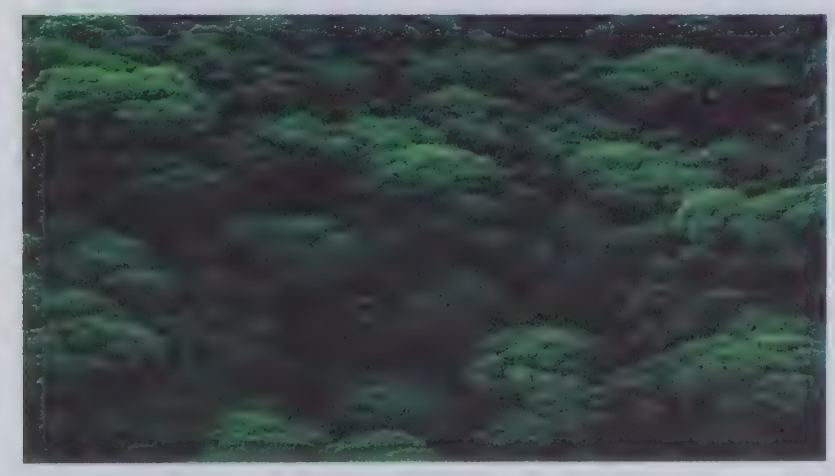


The Western Ghats forests provide 40% of the moisture to the Southwest monsoon, making this the Cherapunji of the South

As per the NIVA Report the Malaprabha Basin can be divided into three distinct zones.

(Refer Map and Topography Sheet Overleaf)

Any damage to Zone 1 as a result of the Bhandura Nala diversion will worsen the present situation. This may well lead to systematic collapse of agriculture and sugarcane cultivation. It will affect availability of water for drinking, domestic use, livestock, and industries. This will hasten desertification of Malaprabha basin and North Karnataka region.



Aerial View of Bhimgad Wildlife Sanctuary

Zone I is adjacent to the Malaprabha Basin. The Bhandura, Kalasa and Haltara diversions are located in Zone I. It is the most thickly forested zone. This is *Not an* Extraction Zone.

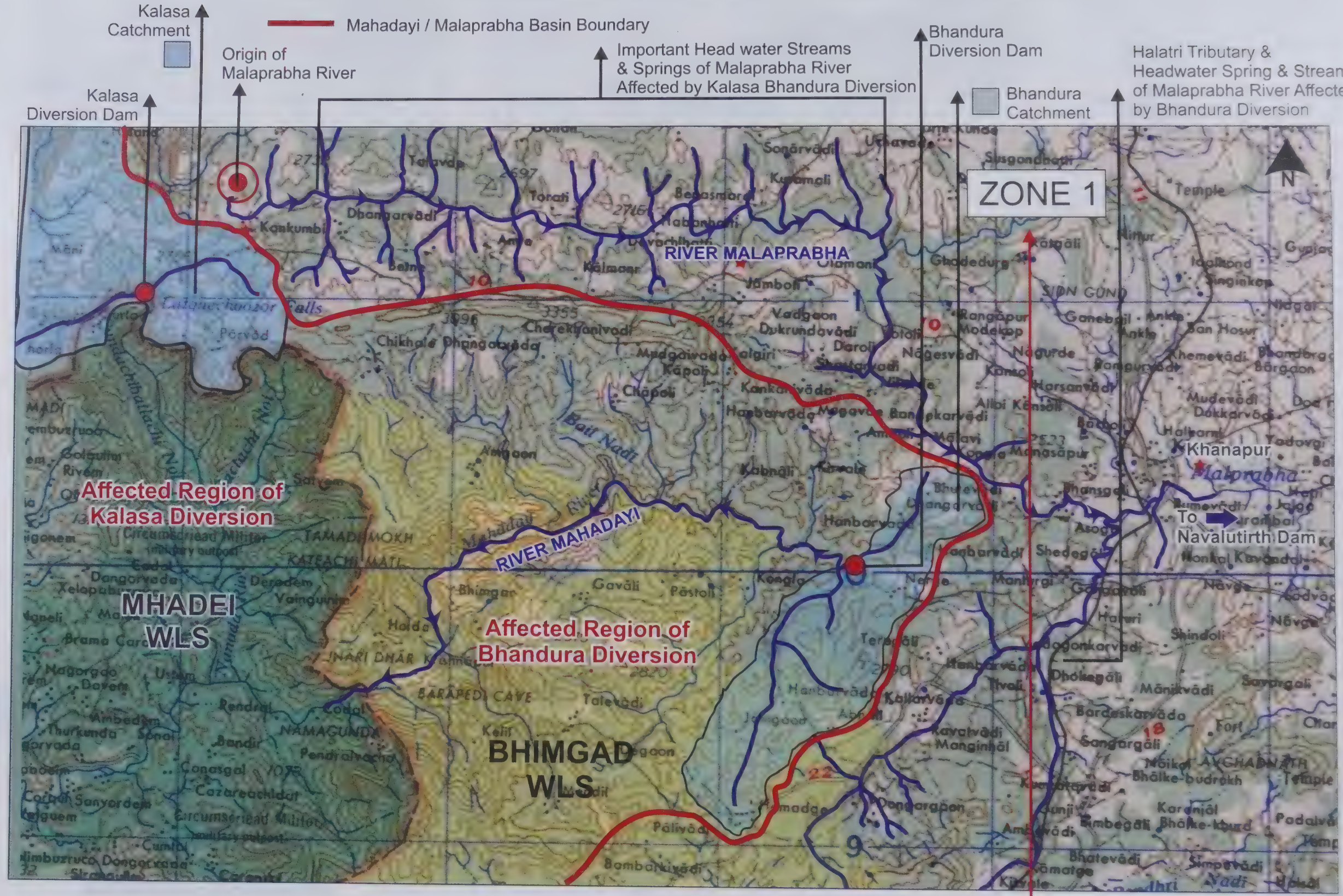
All the headwater springs and streams originate in this region in very close proximity to Mahadayi Basin and adjacent to the three diversion sites. The above fact is clearly evident in the topography sheet.

Any damage and degradation through diversion, as elaborated in the Part II section of this report will have adverse effects on the headwater springs in zone I. It is important to note that *80% of the water which collects in the Renukasagar reservoir originates in Zone I*. The reduction in rainfall due to change in micro climate and increase in temperatures will result in acute shortages in the reservoir.

Zone II in the map indicates the extensive cultivation of sugarcane as per the NIVA 2008 report. At present, in 2025, its cultivation has increased many folds to exacerbate the extraction of water from the basin –both surface, and ground water. This Zone is solely responsible for water availability in zone III.

Zone III also shows a substantial increase in surface cultivation which has further grown many folds since 2008.

Map of Zone I - The Headwater Springs and Streams of River Malaprabha

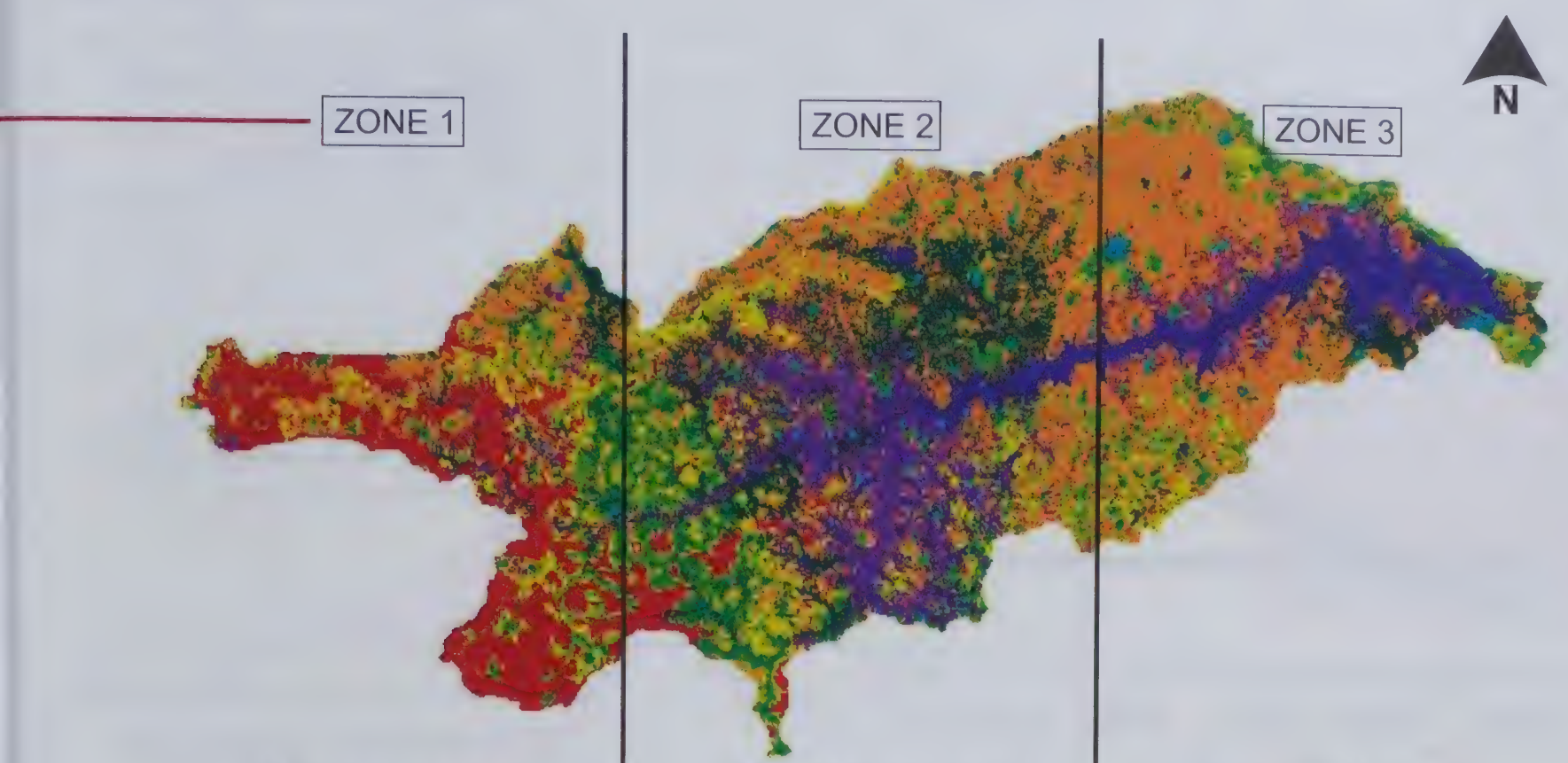

Kalasa Catchment
Mahadayi / Malaprabha Basin Boundary
Origin of Malaprabha River
Important Head water Streams & Springs of Malaprabha River Affected by Kalasa Bhandura Diversion
Bhandura Diversion Dam
Halatri Tributary & Headwater Spring & Stream of Malaprabha River Affected by Bhandura Diversion
Kalasa Diversion Dam
Bhandura Catchment
ZONE 1
RIVER MALAPRABHA
RIVER MAHADAYI
Affected Region of Kalasa Diversion
Affected Region of Bhandura Diversion
MHADEI WLS
BHIMGAD WLS
Khanapur
To Navalutirth Dam
N

Zones in Malaprabha Catchment

80%
of stream flow and ground water recharge

Irrigation extraction

Irrigation extraction



Khanapur Belagavi

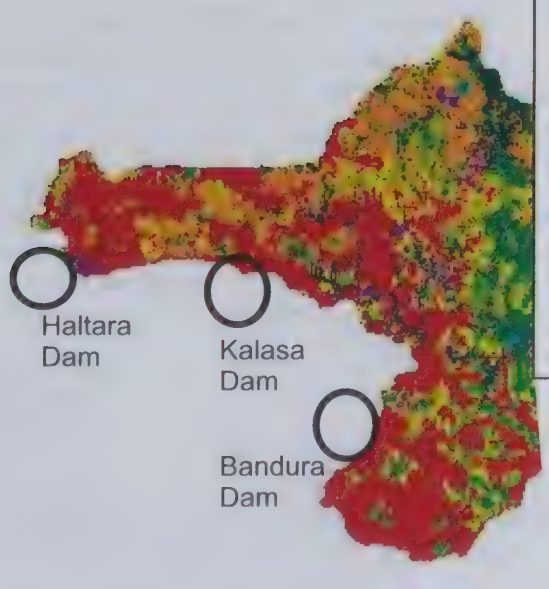
Annual average rainfall
= 1900 mm
Thick vegetation & forest area
GW recharge zone

Bailhongal

Annual average rainfall
= 1000 mm
Mostly agricultural land
GW recharge & extraction zone

Saundatti

Annual average rainfall
= 500 mm
Mostly agricultural land
GW extraction zone



Kalasa Bandura dams and the diversions will damage the very biodiverse forests and the zone which gives Malaprabha River

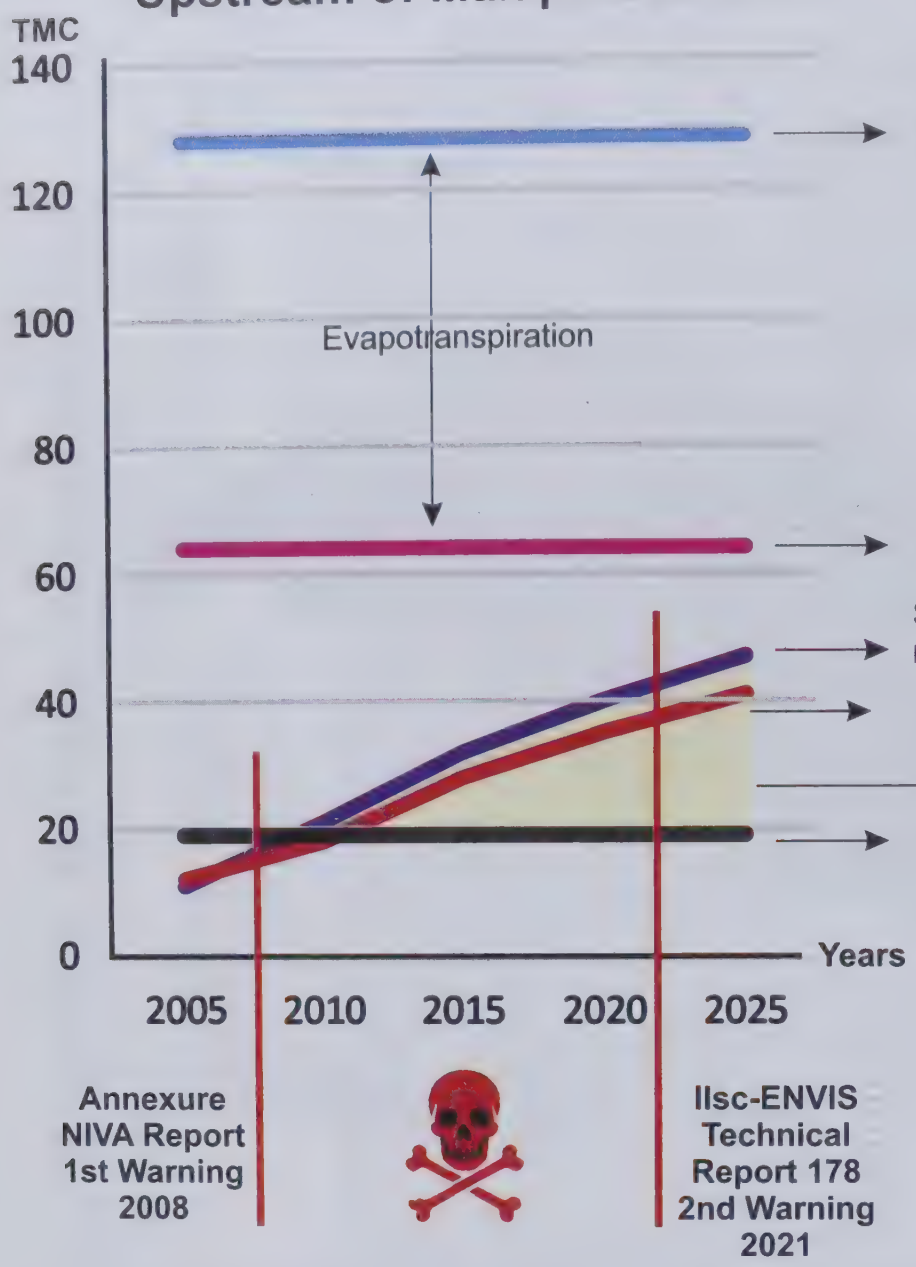
80% of its water

Land cover classes

- Forest
- Built-up area
- Water
- Grass land
- Paddy
- Sugarcane
- Other irrigated crops
- Unirrigated crops

3. Hydrology Data: Supply-Demand Analysis

Upstream of Malaprabha Dam



Sugarcane gross CWR = 0.00088 TMC/ha (≈2,500 mm).

NIR = 0.84 × CWR (credits effective rainfall in semi-arid belts).

Application efficiency: Upstream (GW) 65% → GIR = NIR/0.65; **Downstream (canal) 50% → GIR = NIR/0.50**.

The Widening Gap between the available water and ever increasing demand for sugar plantation

Components	2005	2010	2015	2020	2025
Rain Yield TMC	128	128	128	128	128
Run Off+Gr WTR Recharge TMC	64	64	64	64	64
Available water TMC	19	19	19	19	19
Sugarcane Area in 1000 Ha.	12	18	28	35	41
Gross Sugarcane GIR TMC	11	21	32	40	47

Other demands: Upstream 3.5 TMC, Downstream 20.0 TMC (Domestic + livestock + traditional crops + eco-needs).

Local utilisable supply: derived from rainfall using a **50/38/12** ET/runoff/recharge split; **safe GW draft ≈70% of recharge + ~6–7% distributed capture → ~15% of annual rain** becomes dependable local supply (Upstream **~19.20 TMC** from ~128 TMC rain; downstream **~29.06 TMC** from ~193.7 TMC rain). envis.nic.in+2IMD Pune+2

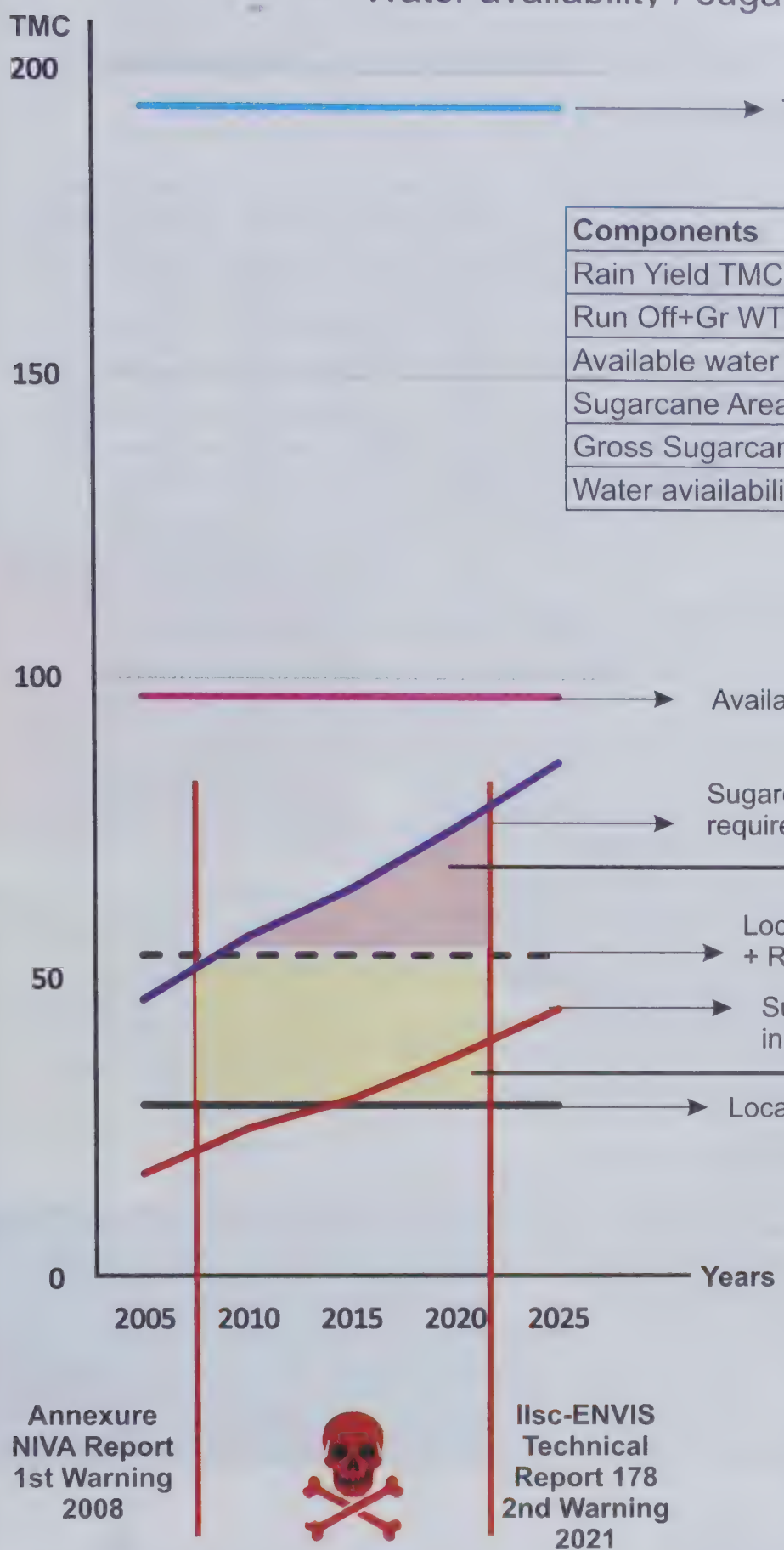
Upstream (catchment ~2,204 km²; local supply ≈ 19.20 TMC)

Year	Sugarcane area (1000 ha)	Sugarcane Gross CWR (TMC)	Sugarcane NIR (TMC)	Sugarcane GIR @65% (TMC)	Other demand (TMC)	Total demand (TMC)	Local supply (TMC)	Balance (Supply − Demand)
2010	18	**15.89**	13.35	**20.54**	3.50	**24.04**	19.20	**−4.84**
2015	28	**24.72**	20.77	**31.95**	3.50	**35.45**	19.20	**−16.25**
2020	35	**30.90**	25.96	**39.94**	3.50	**43.44**	19.20	**−24.24**
2025	41	**36.20**	30.41	**46.78**	3.50	**50.28**	19.20	**−31.08**

Method note: Upstream "local supply" excludes quick runoff that feeds Renukasagar; it takes into account only dependable local GW + distributed capture. envis.nic.in+1

Downstream of Malaprabha Dam

Water availability / sugarcane water demand



Components	2005	2010	2015	2020	2025
Rain Yield TMC	194	194	194	194	194
Run Off+Gr WTR Recharge TMC	97	97	97	97	97
Available water TMC	29	29	29	29	29
Sugarcane Area in 1000 Ha.	17.5	25	30	37	45
Gross Sugarcane GIR TMC	46.5	57	65	75	86
Water aviailability with Res release	54	54	54	54	54

Ever increasing sugarcane water demand is clearly exceeding what Naviluteertha dam can provide with its fullest capacity.
The capacity is already reducing due to silting.

In spite of NIVA Report of 2008, the demand for water for sugarcane was allowed to grow over and above local water availability

Annexure NIVA Report 1st Warning 2008

IIsc-ENVIS Technical Report 178 2nd Warning 2021

Capacity of Naviluteertha Dam **37.7** TMC
Less Siltation **12** TMC in 51 years
Available Water Capacity **25** TMC
CWC 2024 Report

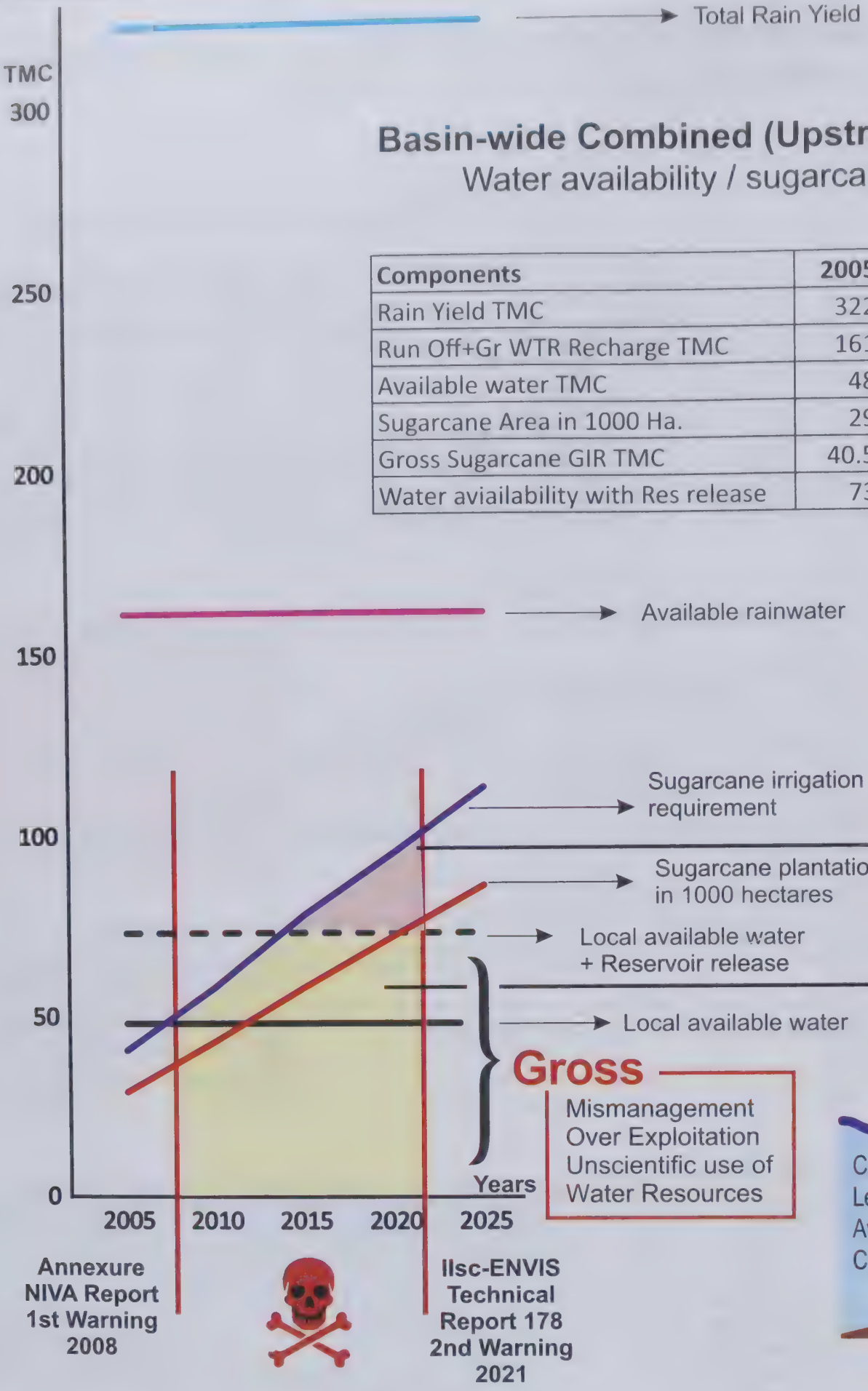
SILT 12 TMC

Downstream (command/balance area ~9,345 km²; local supply ≈ 29.06 TMC)
(Areas from midpoint back-solve: 25,300; 30,800; 37,200; 45,000 ha)

Year	Sugarcane area (1000 ha)	Sugarcane Gross CWR (TMC)	Sugarcane NIR (TMC)	Sugarcane GIR @65% (TMC)	Other demand (TMC)	Total demand (TMC)	Local supply (TMC)	Balance w/o reservoir
2010	25	**22.26**	18.70	**37.40**	20.00	**57.40**	29.06	**−28.35**
2015	30	**27.10**	22.77	**45.53**	20.00	**65.53**	29.06	**−36.48**
2020	37	**32.74**	27.50	**55.00**	20.00	**75.00**	29.06	**−45.94**
2025	45	**39.60**	33.26	**66.53**	20.00	**86.53**	29.06	**−57.47**

25 (TMC) is considered as reservoir water support to meet the demand over and above the local water availability

Method note: "Local supply" from downstream rainfall only; reservoir releases are shown separately because they originate from **upstream runoff regulated by Renukasagar.** Central Water Commission



Basin-wide Combined (Upstream + Downstream)

Water availability / sugarcane water demand

Components	2005	2010	2015	2020	2025
Rain Yield TMC	322	322	322	322	322
Run Off+Gr WTR Recharge TMC	161	161	161	161	161
Available water TMC	48	48	48	48	48
Sugarcane Area in 1000 Ha.	29	43	58	72	86
Gross Sugarcane GIR TMC	40.5	58	78	95	133
Water aviailability with Res release	73	73	73	73	73

Ever increasing sugarcane water demand is clearly exceeding what Naviluteertha dam can provide with its fullest capacity.
The capacity is already reducing due to silting.

Even after warning of NIVA Report of 2008, the sugarcane water demand was allowed to grow exceeding local water availability

Capacity of Naviluteertha Dam **37.7** TMC
Less Siltation **12** TMC in 51 years
Available Water Capacity **25** TMC
CWC 2024 Report

SILT 12 TMC

Basin-wide Combined (Upstream + Downstream)

Year	Total cane area (1000 ha)	Gross CWR (TMC)	NIR (TMC)	GIR (mixed eff.) (TMC)	Other demand (TMC)	Total demand (TMC)	Local supply (TMC)	Balance (Local only)
2010	43	**38.15**	32.05	**57.94**	23.50	**81.44**	48.26	**−33.18**
2015	58	**51.82**	43.54	**77.48**	23.50	**100.98**	48.26	**−52.72**
2020	72	**63.64**	53.46	**94.94**	23.50	**118.44**	48.26	**−70.18**
2025	86	**75.80**	63.67	**113.31**	23.50	**136.81**	48.26	**−88.55**

25 (TMC) is considered as reservoir water support to meet the demand over and above the local water availability

With **local supplies of only (~48.26 TMC/yr)** the basin is in deficit in all years, and the gap widens as cane area and irrigation losses grow. Even with **+60 TMC/yr dependable releases** from Renukasagar, by **2025** the system still shows a **~−28.6 TMC** shortfall on this mid-case. This highlights structural over-allocation to a high-water crop in a semi-arid setting and the efficiency penalty of canal/GW irrigation. Central Water Commission+1

References

- **Rainfall normals (basis for 128 TMC upstream; ~193.7 TMC downstream):** IMD climatological normals remain the standard reference for long-term mean rainfall in Karnataka talukas/stations. IMD Pune
- **Eco-hydrologic partitioning (ET ~50%, runoff ~35–40%, recharge ~10–15% in Malaprabha/Ghataprabha/Mahadayi):** documented in **IISc-CES ENVIS Technical Report 178 (2021)** and related peer work for the Central Western Ghats. envis.nic.in+1
- **Safe groundwater draft ≈70% of annual recharge (not 100%)** is consistent with **CGWB Dynamic Groundwater Resources – Karnataka (2020)** and national compilations; it preserves baseflow and avoids mining. Central Ground Water Board+1
- **Reservoir releases & e-flows context:** CWC hydrological data books guide dependable yields and regulation; policy guidance has also required minimum environmental flows in Indian rivers (e.g., NGT directions; GoI notifications for Ganga), underscoring that not all water is allocable to irrigation. Central Water Commission+1

1. **Crop choice, not rainfall, drives the deficit:** As sugarcane area rises (2010→2025: **43,300 → 86,000 ha** combined), **GIR** explodes (**≈ 58 → 133 TMC**), outpacing dependable **local** supplies (**~48 TMC**).
2. **Efficiency matters:** Upstream GW at **65%** and downstream canal at **50%** inflate withdrawals far above NIR.
3. **Storage alone cannot fix structural demand:** Even **+60 TMC/yr** from Renukasagar barely balances 2010–2015, and fails by **2020–2025** without curbing cane demand or boosting efficiency (e.g., **drip 85–90%**) and reallocating to less water-intensive crops. Central Water Commission

Upstream (≈2,204 km²) — supply derivation from 128.00 TMC rain

Component	% of rain	Volume (TMC)
Evapotranspiration (ET)	50%	64.00
Quick runoff to reservoir	38%	48.64
Recharge	12%	15.36
Safe GW draft = 70% of recharge	—	10.752
Distributed capture = 6.6% of rain	—	8.448
Local utilizable supply (Upstream)	—	10.752 + 8.448 = 19.200 TMC

Downstream (≈9,345 km²) — supply derivation from 193.70 TMC rain

Component	% of rain	Volume (TMC)
Evapotranspiration (ET)	50%	96.85
Quick runoff	38%	73.606
Recharge	12%	23.244
Safe GW draft = 70% of recharge	—	16.2708
Distributed capture = 6.6% of rain	—	12.7842
Local utilizable supply (Downstream)	—	16.2708 + 12.7842 ≈ 29.06 TMC

Interpretation: local rainfall–based supply only; regulated reservoir releases are accounted separately in your demand–supply tables.

Sources (for the caption under your tables)

- **IISc–CES ENVIS ETR-178 (2020–21):** Eco-hydrologic footprint & typical ET/runoff/recharge partitions for Malaprabha/Ghataprabha/Mahadayi. Envis
- **CGWB (2020) Karnataka:** safe groundwater draft practice (~70% of annual recharge). Central Ground Water Board
- **IMD Station Climatological Normals:** rainfall baselines/verification. IMD-DSP

CENTRAL WATER COMMISSION
NEW DELHI
AUGUST, 2024

Capacity Loss

Average Annual % Loss in Gross Storage	0.63	
years since operation	51	since 1974
% capacity loss	32.13	on 2025
Capacity of Renuka Sagar	37.7	TMC
Total loss in capacity	(37.7 x 32.13) / 100 = 12 TMC	
Capacity Loss of Renuka Sagar as in year 2025	12 TMC	

Extract from : **COMPENDIUM ON SEDIMENTATION OF RESERVOIRS IN INDIA**

S. No.	State	Name of Reservoir	Name of River	Catchment Area in Sq.Km.	Year of Completion/ first impound ment	Year of last Survey	Initial Gross Storage in MCM	Total Loss of Gross Storage upto Last Survey in MCM	Percentage % loss of Gross storage upto Last Survey	Percentage % loss of live storage upto Last Survey	Percentage % loss of Dead storage upto Last Survey	Avearge Annual % Loss in Gross Storage	Average Observed rate of siltation (Th.Cu.m/ Sq.km./Yr)
218	Karnataka	Linganamakki	Sharavathi	1991.71	1963	2021	4,435.35	475.54	10.72	9.33	53.13	0.18	4.12
219	Karnataka	Malaprabha	Malaprabha	2,176.00	1981	1991	1,239.66	78.58	6.34	3.12	33.35	0.63	3.61
220	Karnataka	Mani	Varahi	163.16	1989	2021	961.75	71.48	7.43	6.94	13.00	0.23	13.69

Malaprabha River

Present

10 Sugar Factories in Malaprabha Basin

160 kms

ARIHANT SUGAR INDUSTRIES LTD

EID PARRY INDIA LTD

SHRI RENUKA SUGARS LTD

MRN SUGARS LTD

BADAMI SUGARS LTD

Naviluteertha Dam

HARSHA SUGARS LTD

SOMESHWAR SUGARS

LAILA SUGARS

MALAPRABHA SUGARS

MRINAL SUGARS PVT LTD

BAGALKOT

HUNGUND

KUSHTAGI

SAUNDATTI

NARGUND

RON

YELBURGA

BELAGAVI

KHANAPUR

Khanapur

DHARWAD

NAVALGUND

GADAG

HUBLI

KUNDGOL

SHIRHATTI

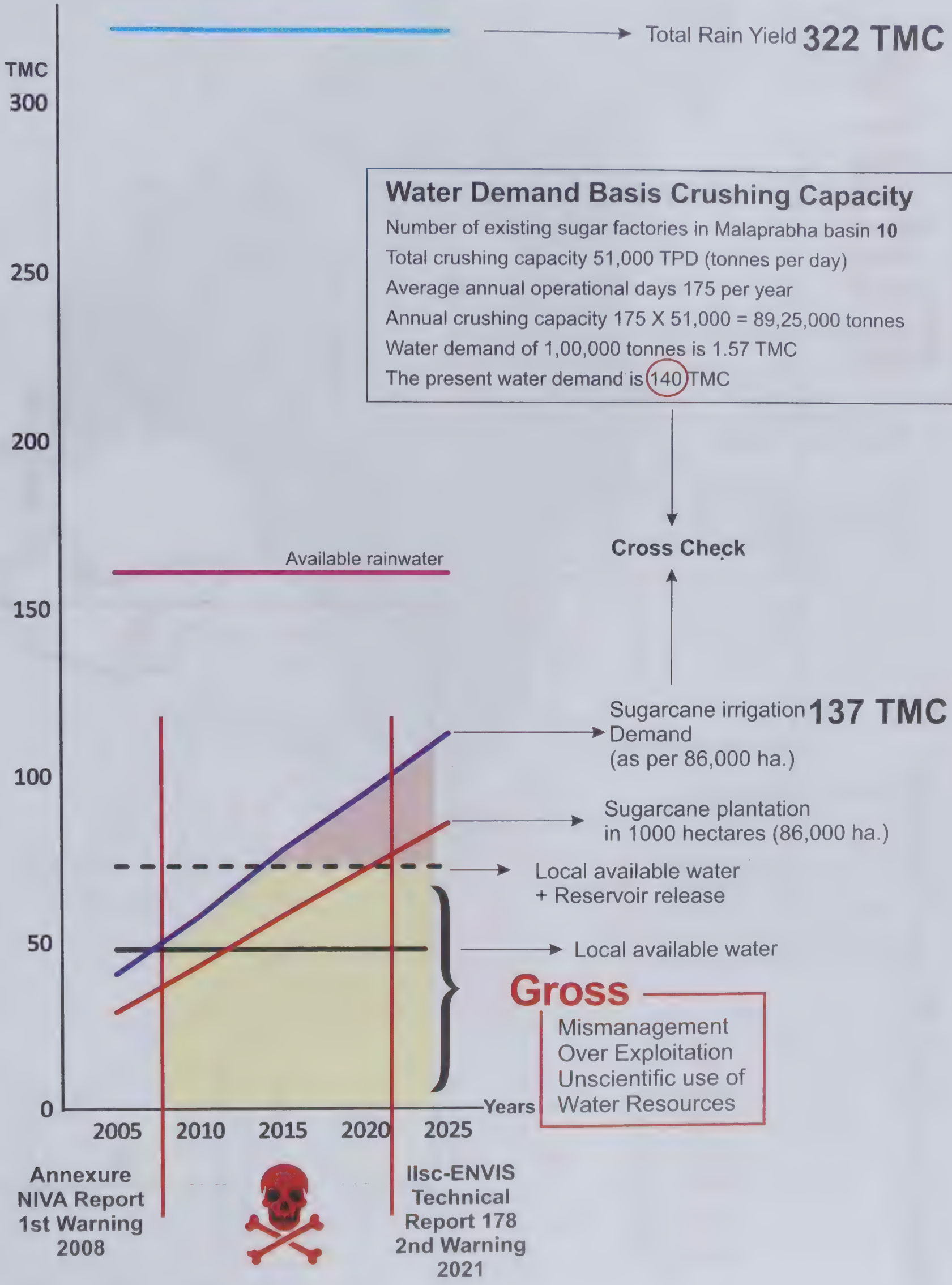
SHIGGAON

INDIA

Naviluteertha Dam
Soundatti

Sugar Factory and its
30km Diameter Foot Print

4. Sugar Industry - The Cause of Desertification



Malaprabha River

Future

160 kms

11 More

Proposed Sugar Factories Malaprabha Basin

Sugar Factory and its 30km Diameter Foot Print

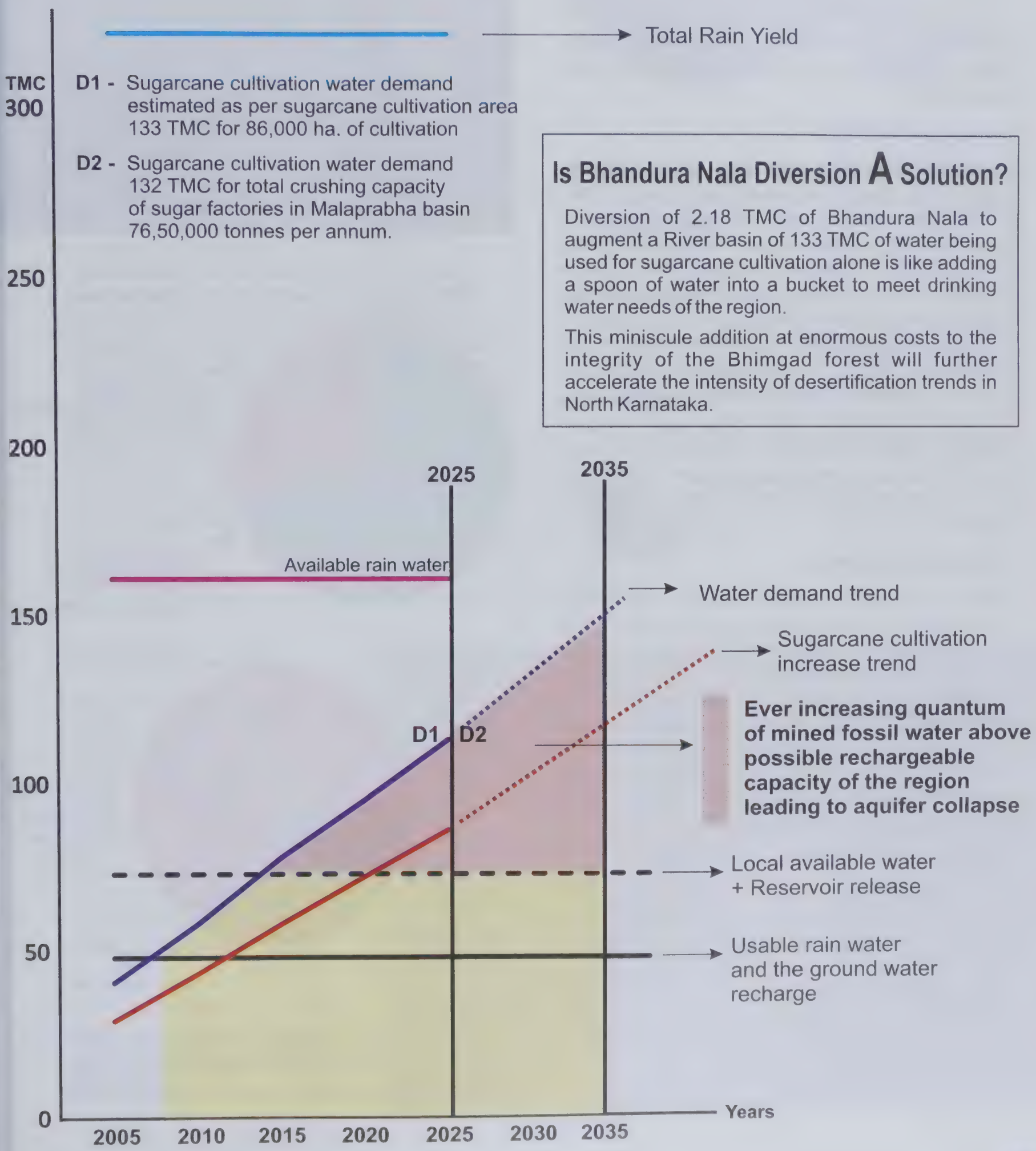
10 Existing

Sugar Factories in Malaprabha Basin

Sugar Factory and its 30km Diameter Foot Print

5. Water Demand Trends Leading to Desertification

The preceding slides indicate the present status of sugarcane cultivation and its demand. They also indicate the intentions of the proposed ten more sugar factories which will drive the water demand for cultivation to rise linearly upwards creating a gap between available water and demand. This will lead to increase in over extraction of mined fossil water leading to desertification, drying of surface water bodies, lowering water table, increase in surface salinity and aquifer collapse. All these triggers will lead to further desertification.



Is Bhandura Nala Diversion A Solution?

Diversion of 2.18 TMC of Bhandura Nala to augment a River basin of 133 TMC of water being used for sugarcane cultivation alone is like adding a spoon of water into a bucket to meet drinking water needs of the region.

This miniscule addition at enormous costs to the integrity of the Bhimgad forest will further accelerate the intensity of desertification trends in North Karnataka.

6. Malaprabha Basin's Agrarian Communities

1. Traditional Farming in the Malaprabha Basin

Over 2,00,000 hectares in the Malaprabha basin are under traditional, rainfed crops such as jowar, pulses and oilseeds. These farmers are the majority in the basin and already face uncertainty due to erratic monsoons. Any reduction in rainfall from the Bhandura diversion, especially in Khanapur taluka (which contributes ~80% of inflow to Renukasagar), will directly translate into crop failures, soil moisture stress and worsening indebtedness for these smallholders.

2. Sugarcane Growers

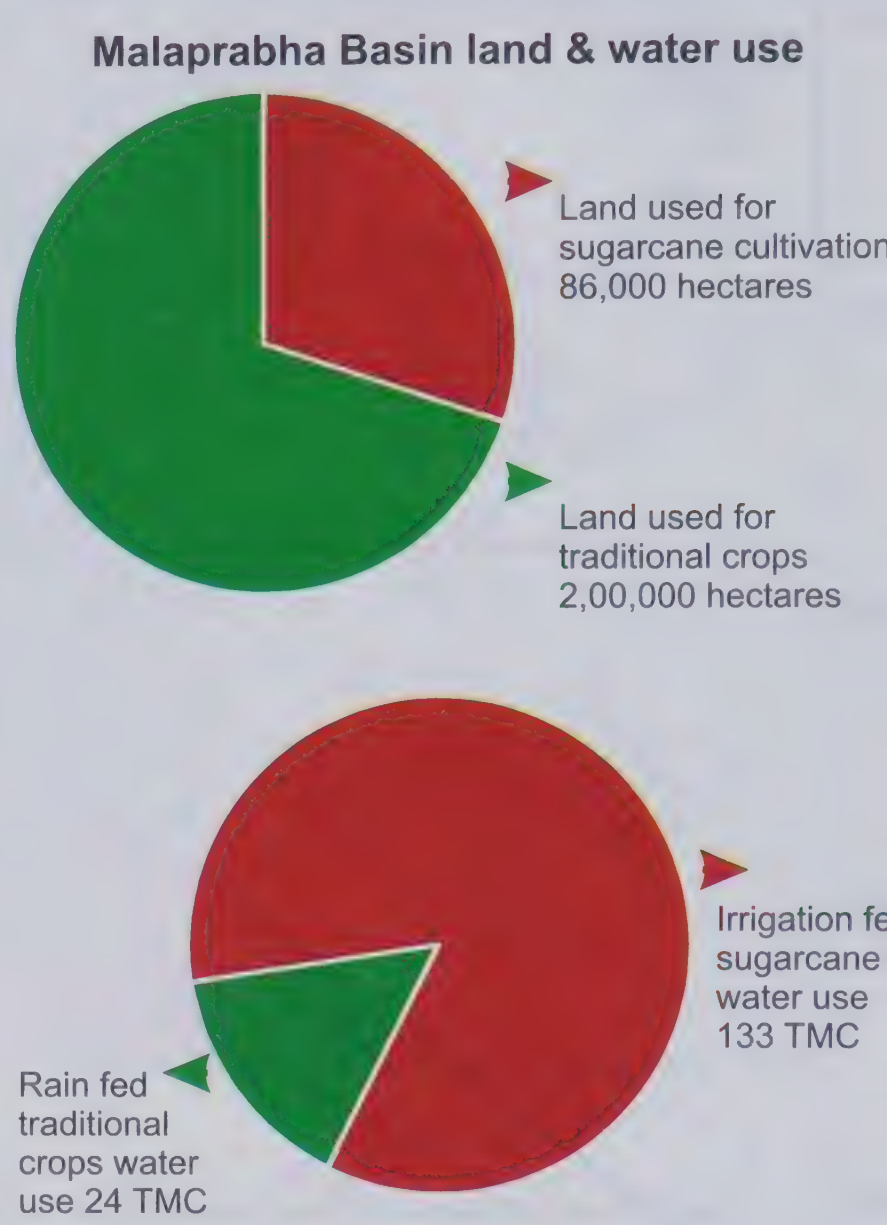
Around 90,000 hectares of sugarcane are cultivated in the basin, supported heavily by irrigation from Renukasagar reservoir and groundwater extraction. Sugarcane is a water-intensive crop, consuming ~1,800–2,200 mm water per year. With rainfall decline and reduced dam inflows, canal releases will shrink, forcing farmers to over-exploit groundwater. In an already over-extracted aquifer zone, this could trigger well failures, higher pumping costs and declining yields. This can be averted through a switch to modern irrigation techniques such as drip irrigation, organic package of practices and crop diversification as proven by progressive farmers like Krishi Pandit Shri Suresh Desai of Bedkihal village, Belagavi.

3. Sugarcane Industry

The basin hosts 10 sugar factories, collectively crushing over 5.9 million tons of cane annually. This industry sustains thousands of jobs and contributes significantly to the regional economy. Unless quick conversion steps to smart cane growing practices are taken, cane supplies will steadily dwindle. Mills could face underutilization, operational losses, even closures similar to what has occurred in Maharashtra. The knock-on effect would hurt employment, transport and ancillary rural livelihoods.

4. Groundwater and Reservoir Security

Both traditional farmers and sugarcane growers depend on groundwater recharge from monsoon rainfall. With diversion-induced rainfall decline, recharge will weaken while extraction pressure rises. Simultaneously, Renukasagar reservoir—already stressed in low-rainfall years—will receive less inflow from its headwaters, further limiting water available for irrigation, drinking and industry.


Malaprabha Basin land & water use
Land used for sugarcane cultivation 86,000 hectares
Land used for traditional crops 2,00,000 hectares
Irrigation fe
sugarcane
water use
133 TMC
Rain fed traditional crops water use 24 TMC

Any reduction in rainfall (Bhandura diversion, Western Ghats forest loss, or climate variability) **hits the majority rainfed farmers first, and hardest.**

5. Population at Large

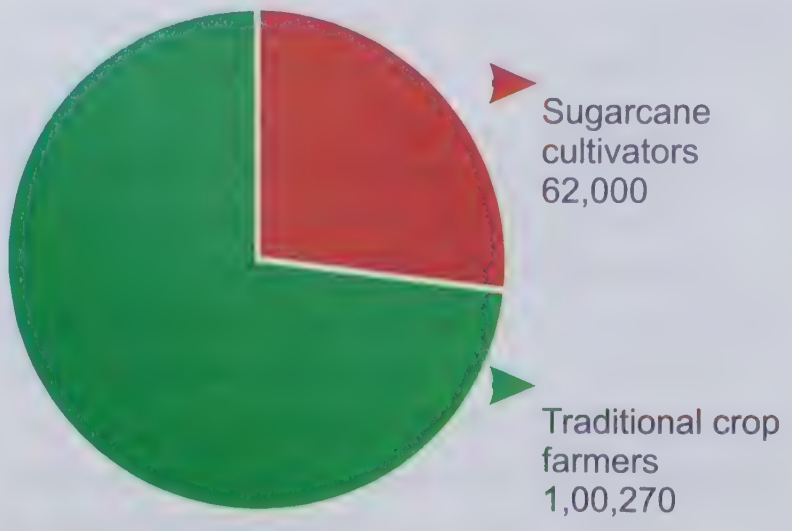
The basin's villages, towns, and cities draw directly from Malaprabha reservoir for drinking water supply. Reduced inflows will compromise allocations to urban populations, intensify conflicts between irrigation and drinking water users, and aggravate public health risks. Over time, these pressures heighten the risk of regional desertification, undermining food security and water security alike.

A geographic study reports that **68.37% of the Malaprabha basin's workforce** (61.75% of males, and 79.55% of females) depends on **agriculture and allied activities**.

Approximately one-third of the agrarian community in the Malaprabha basin are rainfed farmers, and many of these are likely **not sugarcane growers**, since sugarcane is almost exclusively irrigated.

> "The proposed Bhandura diversion may appear to affect only 2.18 TMC of water, but its ecological feedbacks threaten the livelihoods of the majority in the Malaprabha basin's unirrigated smallholder farmers. Already dependent solely on monsoon rainfall, these farmers face heightened risk of crop failure, groundwater exhaustion, food insecurity and migration. While sugarcane growers and the sugar industry may absorb shocks through irrigation and capital, it is the rainfed smallholders—the backbone of regional food security—who will bear the brunt of desertification triggered by reduced rainfall."

Malaprabha Basin Demographics



- **Smallholders in unirrigated lands** do not have access to canal water or reliable groundwater.
- They rely directly on **monsoon rainfall** for soil moisture and crop success.
- Any reduction in rainfall (even 5–10%) translates immediately into **lower yields, crop failure, or abandonment of fields**.
- Abandoned fields lead to further desertification
- Rain fed traditional farmers will be the first to face the brunt of reduction in rainfall

Foretelling a Bleak Future

The Bhandura diversion risks creating a chain reaction in the Malaprabha basin—less rainfall in Khanapur → reduced reservoir inflows → shrinking irrigation supplies → stress on both traditional and sugarcane farmers → decline in cane availability for sugar factories → worsening groundwater crisis → reduced drinking water security.

The burden will fall most heavily on smallholder traditional farmers, but the sugar economy and urban populations will also be destabilised.

7. Drivers of Desertification

(i) Over-extraction of Groundwater leads to Soil Aridity

- Sugarcane cultivation depends on intensive groundwater extraction using borewells, especially in rain-shadow talukas like Ron, Nargund and Ramdurg
- Continuous withdrawal of groundwater dries up the subsoil moisture, making land unsuitable for rainfed crop
- Even after the monsoon, fields fail to retain moisture, leading to dust formation, cracking soils and loss of fertility

(ii) Deforestation in Catchment leads to Reduced Rainfall

- The Western Ghats catchment of the Malaprabha (including forest of Bhimgad and Jamboti) has faced deforestation due to road-building (e.g., for power lines, Kalasa-Bhandura diversion works so far)
- This leads to:
  - Less evapotranspiration
  - Disruption of orographic rainfall mechanisms
  - Dry spells during monsoon (late onset, early withdrawal)
- Reduced recharge of rivers and aquifers pushes the system toward semi-arid conditions, even if long-term rainfall is only moderately reduced

(iii) Water consumption by Sugarcane leads to Crop Abandonment Elsewhere

- Sugarcane gets uninterrupted canal and borewell water, while traditional crops like jowar, bajra and pulses in surrounding areas fail due to lack of access to water.
- These lands are often left fallow, exposing the topsoil to sun and wind
- Fallowing without regeneration leads to:
  - Loss of humus
  - Wind erosion
  - Hard pan formation — hallmarks of dry desertification

(iv) Loss of Vegetation Cover and Soil Organic Matter

- Monoculture sugarcane cycles and mechanical harvesting reduce soil organic carbon (SOC).
- No cover crops or biomass recycling leads to soil micro-biome collapse
- Bare soils without mulch or vegetation reflect more sunlight, increasing local land surface temperatures, intensifying aridification

7.1 Cumulative Impact: Drying of the Basin

Despite being in a historically water-rich region:

- Rivers like Bennihalla, Hirehalla, and even Malaprabha have seasonal flow or remain dry
- Forest and scrublands are replaced with barren lands or degraded fallows
- Dust storms during summer are now reported from Bagalkot and parts of Belagavi and Dharwad

7.2 Scientific Indicators of Dry Desertification in Malaprabha Basin

Indicator	Observation in Malaprabha Basin
Rainfall decline (last 30 years)	~10-15% decline, especially post-2000
Groundwater level fall	>5-10 meters in parts of Ron, Nargund
Soil organic carbon	Depletion in dryland villages (<0.5%)
Wind erosion risk	Rising in post-monsoon months
Fallow land expansion	Up to 20% in tail-end irrigation zones

Sources: SACON, ATREE, Karnataka Groundwater Authority, S. Viswanathan (2020–2023 studies).

8. Wet Desertification

Prominent Ecologist from Bengaluru, Dr Yallapa Reddy, warns of Wet Desertification of Malaprabha basin.

Wet desertification, in the context of the Malaprabha basin's sugarcane-growing areas, refers to the process where once-fertile and irrigated lands deteriorate due to water mismanagement, over extraction, and ecological degradation—not from lack of water alone, but from unsustainable overuse, especially for high water-demand crops like sugarcane.

Unlike classic desertification caused by aridification or drought, wet desertification occurs when:

- Irrigation-fed areas lose productivity due to waterlogging, salinization, groundwater depletion, or reduced surface flows
- Over-irrigation and unsustainable ground-water pumping result in long-term soil and water degradation
- Ecosystems and hydrological cycles are disrupted, often in river basins with initially good rainfall or dam-fed irrigation

This is increasingly relevant in India, including parts of Punjab. It now threatens North Karnataka.

8.1 Wet Desertification in the Malaprabha Basin

- The Malaprabha basin, especially Belagavi, Bagalkot, Dharwad, and Gadag, is a key sugarcane zone
- Large parts are heavily irrigated by the Naviluteertha dam and canal system; groundwater is also extensively used

(i) Sugarcane Cultivation Statistics

- Sugarcane cultivation occupies up to one lakh hectares in the basin
- Annual water requirement: ~120 TMC (including surface + groundwater)
- Rainfed agriculture and traditional cropping (like jowar, pulses, groundnut) have been displaced

(ii) Key Drivers of Wet Desertification

Driver	Explanation
Over-extraction of groundwater	Rapid decline in water tables due to 12-month crop cycles and borewell use
Waterlogging and salinization	Poor drainage in low-lying areas under continuous sugarcane monoculture
Declining river inflows	Deforestation in catchment and climate change reduce inflow from Khanapur and Bhimgad
Hydrological imbalance	Evapotranspiration is rising due to sugarcane cultivation; less water recharges the aquifer
Reduced crop diversity	Soil fertility and structure degrade in the absence of crop rotation; increasing vulnerability

(iii) Scientific Concerns and Evidence

- S. Viswanathan (IISc, 2020–23): Studies show salinity and evaporation linkages causing microclimatic drying.
- Catchment Area Development Authority (CADA), Karnataka & Groundwater Board: Show falling groundwater levels and failure of borewells in Navalgund, Ron, Nargund, and Bailhongal

(iv) Serious Threat of Becoming a 'Green Drought Zone'

- *Paradox of drought in a dam-fed region:* Despite a major dam (Naviluteertha), farmers face summer scarcity
- *Long-term crop failure risk:* Salinity and falling aquifers reduce sugarcane yield over time
- *Social stress:* Farmer suicides, borewell failures and rural distress are rising

- *Desert*ification risk expansion: Areas already under stress—like Ron, Nargund, Navalgund and Bailhongal—are ground zero for wet desertification

  Wet desertification in the Malaprabha basin is already underway due to unsustainable sugarcane expansion, groundwater collapse and ecological degradation upstream. Without drastic course correction—such as crop diversification, water budgeting, reforestation of catchments and cap on sugarcane expansion—**the region risks becoming India's next "green drought" zone.**

8.2 Bhandura Nala Diversion will Accelerate Wet Desertification

(i) Malaprabha's Water Source: Evergreen Forests of Bhimgad

- The Bhimgad Wildlife Sanctuary is part of the Western Ghats, a globally recognised rainmaking engine
- These evergreen forests generate massive evapotranspiration forming localised convective rainfall cells, especially crucial after monsoon (pre- and post-monsoon spells)

(ii) Loss of Moisture Recycling

- Diverting Bhandura and its effect on Bhimgad forest will lead to drying of microclimates, suppressing local cloud formation and rainfall
- Viswanathan's 2020–23 study showed that salinity and reduced wetland area decrease evaporation, reducing atmospheric humidity, thereby suppressing rainfall feedback loops

(iii) Downwind Effect on Rain-shadow Zone

- Malaprabha basin is located downwind of Bhandura and Bhimgad
- Moisture-laden air that would have rained down in Dharwad, Belagavi, Nargund, etc., diminishes if the upstream forests dry
- This effect has been documented by IISc and ATREE in Western Ghats hydrological studies

8.3 Rainfall Reduction Expedites Wet Desertification

(i) Collapse of Supplemental Rain Support

- Sugarcane, though heavily irrigated, relies on rainfall to reduce irrigation stress, especially in July–October
- A 10–20% drop in rainfall shifts dependence entirely to groundwater and canals, already overdrawn
- **As rainfall becomes erratic, crop planning and sowing cycles collapse**

(ii) Soil Salinity & Degradation Rise

- Less rainfall means lower leaching of salts from the root zone
- This accelerates salinization, especially in tail-end fields of canals
- ATREE's studies in Peninsular India show decline in soil organic matter due to failed crop rotations under reduced rain

(iii) Groundwater Depletion Deepens

- Without rain to recharge aquifers, borewells run dry faster
- In regions like Nargund and Ron, many farmers drill borewells up to 1000 ft. or more—some yielding saline water
- Increased heat and land surface drying
- Reduced rainfall increases land surface temperature
- This leads to higher evapotranspiration, further dehydrating soils and vegetation—a self-reinforcing desertification loop

8.4 Case Study: Rainfall-Retreat and Desertification Nexus

Location	Rainfall (mm/year)	Sugarcane Area of Irrigated Land (%)	Borewell Failures	Desertification Trend
Navalgund	↓ from 650 to 500	>60%	Frequent	Advancing
Bailhongal	↓ from 900 to 720	>45%	Moderate	Moderate-High
Nargund	↓ from 620 to 470	~50%	High	Severe
Ron	↓ from 600 to 450	~40%	High	Severe

(Sources: IMD 1980–2020, CADA, CGWB, SACON/ATREE reports)

Rainfall Suppression by Forest Loss: Viswanathan's Hypothesis

8.5 Dr S. Viswanathan's Work (IISc, 2020–23) Demonstrates

- Reduction in rainfall due to deforestation-induced reduction in evaporation
- Evaporation from saline or degraded lands is significantly lower
- Loss of upstream green cover and streamflow reduces the capacity of convective cloud formation

The reduction in rainfall caused by the diversion will amplify all drivers of wet desertification in the sugarcane zones of the Malaprabha basin. Unless the flows in Bhimgad Forests are preserved, the entire farming system may collapse within a decade, even before groundwater physically runs out.

9. Cancer Risk due to Wet Desertification

The chain of environmental, agricultural and hydrological consequences pose high risk of cancer particularly in regions like Punjab and now increasingly in North Karnataka's sugarcane belt such as the Malaprabha basin.

Wet Desertification Factor	Cancer Risk
1. Groundwater depletion and overuse	Concentrates, known carcinogens such as nitrates, fluoride, and heavy metals in deep aquifers
2. Waterlogging and salinity	Triggers increased use of agrochemicals (fungicides, soil conditioners), many of which are toxic or carcinogenic
3. Monoculture cropping (like sugarcane)	Encourages excessive pesticide, herbicide, and fertiliser usage, which leach into water and food chains
4. Stagnant or poor-quality irrigation Water	Encourages biological contamination and nitrate/nitrite conversion in drinking sources. These are linked to gastric and bladder cancers

Scientific Mechanisms Linking Wet Desertification and Cancer

(i) Chemical Concentration in Groundwater

- In borewell-dependent areas like Nargund, Navalgund, and Ron, groundwater often has:
  - ➢ Nitrates > 45 mg/L → Linked to gastrointestinal cancers
  - ➢ Fluoride > 1.5 mg/L → Associated with bone and joint cancers
  - ➢ Uranium/arsenic in trace quantities → Detected in Punjab; potential in deep Deccan aquifers too

Studies by the Central Ground Water Board (CGWB) and Bhabha Atomic Research Centre (Punjab) have shown nitrate and uranium accumulation in aquifers where water tables dropped below 100 m, leading to increased cancer burden

(ii) Pesticide and Herbicide Overuse

- Wet desertification reduces soil fertility, pushing farmers to intensify chemical use
- Common chemicals used in sugarcane:
  - ➢ Glyphosate (herbicide): probable human carcinogen (IARC Group 2A)
  - ➢ Chlorpyrifos: linked to lung and prostate cancer
  - ➢ 2,4-D, Atrazine: endocrine disruptors and suspected carcinogens

These leach into soil and shallow aquifers, contaminating drinking water in rural schools, homes and tanks/ *kere*.

(iii) Stagnant Saline Water leads to Bacterial & Nitrite Load

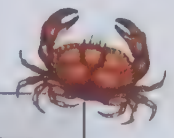
- Saline or waterlogged soils produce anaerobic microbial conditions
- Converts nitrate to nitrite, which reacts with amines in the stomach to form nitrosamines. These are powerful carcinogens directly implicated in gastric, oesophageal and bladder cancers

Emerging Concern: North Karnataka Risks Mirroring Punjab

Region	Observed / Potential Link
Punjab (Malwa Belt)	High groundwater nitrate, pesticide use and spike in cancer incidence. "Cancer Train" to Bikaner evidence of epidemic. BARC's Cancer Hospital and Research Centre at Mohali district Punjab is an indication of the severity of the problem there
North Karnataka (Malaprabha Basin)	Similar sugarcane-dominated monoculture, groundwater overuse, agrochemical intensification and fluoride exposure. Early warning signs already present

Scientific / Institutional References

- BARC (2015): Uranium and nitrate in Punjab borewells linked to rising cancer burden.
- Viswanathan et al. (IISc, 2021–2023): Water evaporation, salinity and pollution cycle increasing toxicity in aquifers.
- CGWB Reports: Nitrate and fluoride hotspots in Karnataka's Ron, Navalgund, Nargund, Badami and Gadag.
- IARC Monographs: Glyphosate, Atrazine, and other sugarcane chemicals classified as probable carcinogens.



If wet desertification continues, cancer risk zones will expand across agro-industrial districts in North Karnataka, especially in Belagavi, Bagalkot, Gadag (Ron, Nargund) and Dharwad rural belt. This raises an urgent need for environmental health mapping, cancer registry monitoring and borewell water quality surveillance.

PART III

Ways to Avert Desertification

1. The Naviluteertha Dam

The Naviluteertha Dam was constructed across the Malaprabha River at Savdatti in Belagavi District, Karnataka and became operational in 1974. It created the Renukasagar Reservoir, which is the agricultural lifeline for large parts of northern Karnataka, especially Belagavi, Bagalkot, Dharwad and Gadag districts.

More than 86,000 hectares of sugar cane cultivation and nine sugar factories have now become a very important component of Belagavi District's economy. Although they cannot be dispensed with, their role in averting North Karnataka's imminent desertification becomes critically important and an immediate necessity.

1.1 Objectives of the Naviluteertha Dam

As per the Water Resources Department (WRD), Karnataka, and CADA (Command Area Development Authority) and irrigation planning documents, the primary objectives were:

(i) Irrigation for Traditional Crops

- Support dryland farmers with assured irrigation in the drought-prone Malaprabha basin
- Promote cultivation of millets (jowar, bajra), pulses (tur, gram), oilseeds (groundnut, sunflower) and traditional cereals
- Designed for protective irrigation, not water-intensive crops

(ii) Drinking Water Supply

- Provide safe drinking water to urban and rural settlements, including Dharwad, Hubali, Nargund, Ron, Saundatti, etc.

(iii) Flood Control

- Control seasonal flooding of the Malaprabha River during heavy monsoons

(iv) Hydropower Generation (Secondary goal)

- Small-scale hydropower potential was planned but remains limited in output

(v) Groundwater Recharge & Ecological Balance

- Improve aquifer recharge and reduce groundwater over-extraction.
- Prevent aridification/desertification of North Karnataka.

1.2 Sugarcane Cultivation and Factories Defeated these Objectives

Despite these well-intentioned goals, the unregulated expansion of sugarcane cultivation and sugar factories has derailed the dam's original purpose in the following ways:

(i) High Water Consumption by Sugarcane

- Sugarcane needs 18–20 million litres per hectare per year (~20,000 m^3)
- Potentially 86,000 hectares of sugarcane can consume >120 TMC annually
- This is disproportionate to the dam's design capacity and allocation

(ii) Monopoly on Irrigation Water

- Water allocated for food security crops and drinking water is diverted to sugarcane
- Tailend farmers (especially in Gadag and Bagalkot) suffer due to upstream water capture

(iii) Sugar Factory Pressure on Policy

- 9+ sugar factories in the Malaprabha basin lobby for assured water supply
- Political-industry nexus prioritises water for sugarcane cultivation and sugar industry requirements over equitable rural use

(iv) Groundwater Depletion

- Sugarcane fields resort to borewell irrigation when surface water is insufficient
- This defeats aquifer recharge goals and contributes to water stress and desertification

(v) Desertification of Traditional Farming Zones

- Traditional crops, which require less water and are climate-resilient are disappearing
- Soil salinisation and loss of biodiversity follow

(vi) Climate Mismatch

Malaprabha basin is a semi-arid zone (avg. 600–700 mm rainfall)

Sugarcane is suitable for high-rainfall coastal belts, not this rain-shadow region

Desertification and wet desertification of North Karnataka are now clearly an imminent danger.

Scientific / Institutional References

- WRD Karnataka Project Reports on Malaprabha Irrigation
- CADA Malaprabha Annual Reports (1990s–2010s)
- Viswanathan, S. (2022) – "Aridity and Desertification in North Karnataka"
- ISRO/SAC NRSC Desertification Atlas of India (2021/23)
- ATREE-SACON Mahadayi Basin Ecological Report (2020) – Contextual spill over effects

1.3 The Present

Malaprabha basin today hosts nine Sugar factories. The 10th sugar factory has recently received approval. Nine more sugar factories are in the pipeline. Sugarcane plantation has doubled in the last 5 years and is now more than 86,000 hectares. The sugar factories and sugarcane growers are the backbone of Belagavi District's economy. However, the industry is consuming more than 120 TMC of water.

Renukasagar, due to Malaprabha catchment degradation and silting, can support only 25 TMC. More than 100 TMC is extracted from groundwater aquifers. Spread of sugarcane plantation with such wrong practices in the catchment area is further reducing the perenniality of Malaprabha.

Economy and Ecology are at loggerheads, pushing the region into Dry and Wet desertification

A mere 2.18 TMC through diversion of Bhandura Nala by causing irreversible damage to Western Ghats is NOT a solution. Rather, it will be a dominant factor accelerating desertification.

2. Role of Sugar Factories in Mitigating the Crises

The solution is in sugar factories immediately undertaking systemic, science-backed reforms that balance economic interest with ecologically responsible practices, delivering water justice for everyone and for the survival of the sugar industry itself.

2.1 Water Efficiency and Crop Shift

(i) Adopt Water-Smart Sugarcane Cultivation

- Drip irrigation: Saves 40% water compared to flood irrigation
- Mulching: Reduces soil evaporation and water loss
- Ratoon management: Reduces the need for replanting and water inputs

Drip irrigation alone can save 40 % of 100 TMC extracted water, creating 40 TMC of water in the basin.

Fund Drip irrigation to contracted farmers and procure sugarcane only from the farmers who practice drip irrigation

(ii) Reduce Area under Sugarcane

- Voluntarily limit procurement to sugarcane grown in command zones only
- Encourage crop rotation with millets, pulses, and oilseeds in factory-linked farms

(iii) Promote Alternate Crops in Buyback Schemes

- Launch community farming models for drought-resilient crops like tur (pigeon pea), sunflower, groundnut, or even sweet sorghum (ethanol substitute)
- Pay incentives to farmers for low-water sugarcane crops linked to factory supply chains

(iv) Create Bio-Composting Units

- Convert press mud and spent wash into organic manure
- This can be sold or distributed to farmers, reducing chemical dependency

Organic cultivation of sugarcane has shown a 60% increase in yield of sugarcane with 50% less Water. Encourage sugar factories and Panchayats to create demonstration plots for farmers' education. Suresh Desai, Krishi Pandit of Bedkihal village, Belagavi has perfected this technique and trained thousands of farmers in Punjab and overseas. He may be consulted on this matter. *(Refer Annexure IX)*

(v) Recharge the Aquifer

- Use factory land and part of the farmers land to create percolation ponds, farm bunds, and recharge wells. Fund such initiatives
- Help restore pre-monsoon groundwater levels that are falling across the basin

(vi) Catchment Area Treatment

- Fund reforestation in upper catchments (esp. Khanapur taluka) as part of CSR initiatives
- This aligns with dam's objective of sustained inflow and soil retention

(vii) End Political Capture of Water Allocation

- Disengage from lobbying for water allocation beyond capacity
- Support transparent irrigation scheduling in the Command Area

(viii) Shift Ethanol production from Sugarcane to Sweet Sorghum or Cassava

- These crops use less water and can produce comparable ethanol yields
- Reduces dependence on sugarcane for distilleries

(ix) Decentralise Distilleries

- Avoid clustering large ethanol plants near a single dam-dependent region
- Consider satellite distilleries in more suitable agro-climatic zones

2.2 Educating Sugarcane Growers in the Malaprabha Basin

(i) Switching to Water-Efficient Irrigation

- Replace flood irrigation with:
  - ➢ Drip irrigation (reduces water use by 40–50%)
  - ➢ Alternate furrow irrigation
  - ➢ Scheduled irrigation based on soil moisture sensors
- Use mulching with sugarcane trash or organic farm residues to conserve soil moisture and reduce evaporation

(ii) Diversifying Crop Rotation

- Introduce legumes or pulses in rotation with sugarcane to:

  - Replenish nitrogen in soil
  - Improve soil structure and organic carbon
  - Break pest cycles
- Avoid mono-cropping — diversify at least one crop per year to increase resilience

(iii) Adopting Sustainable Varieties & Practices

- Use short-duration, high-yield sugarcane varieties that mature in 9–10 months instead of 12–14 months
- Promote trash mulching, organic compost and integrated nutrient management (INM)
- Avoid overuse of chemical fertilisers, which degrade soil and reduce water-holding capacity
- Incentivise organic sugarcane production along with drip/sprinkler irrigation

(iv) Recharging Groundwater and Restoring Commons

- Encourage collective initiatives through farmer and watershed management groups to:
  - Build check dams
  - Desilt village tanks and nalas
  - Plant trees in community grazing lands and bunds
- Reduce reliance on borewells through community water budgeting

(v) Shifting Cultural Outlook and Mind-set

The real challenge is not technical, but social and economic. Many farmers grow sugarcane because:

- It is linked to credit from sugar mills
- Provides assured purchase
- Is deeply entrenched as a cash crop

Thus, policy reforms, factory support, and community-led change are all necessary.

(vi) Access Government Schemes and R&D Support

Leverage:

- PMKSY (Pradhan Mantri Krishi Sinchayee Yojana) for micro-irrigation
- Soil Health Cards for tailored fertilizer use
- State sugarcane zoning and buy back support (especially in Karnataka)
- Karnataka Watershed Development Department and KREDL for watershed and agroforestry
- Water and Land Management Institute (WALMI), Dharwad must play a central part in bringing the shift in all aspects related to this endeavour

2.3 Impact of these Measures

Problem	Corrective Action	Expected Impact
Water overuse	Drip, area control	Save >40% irrigation water
Groundwater depletion	Recharge + Crop shift	Aquifer recovery
Farmer distress	Alternate crops, contracts	Risk-proof income
Ecosystem damage	Reforestation, bio-compost	Soil & river health recovery
Desertification risk	Reduce monoculture	Halt aridification

Inspiring Precedents

- Maharashtra's Pune Sugar Co-ops: Adopted water budgeting and diversified crops
- Tamil Nadu's EID Parry: Introduced contract farming for ethanol from sweet sorghum
- Telangana's Mission Kakatiya: Factories co-funded village tanks for water recharge

3. Required Actions from the Government

(i) Water Budgeting and Crop Diversification in Malaprabha Basin

- Implement real-time water accounting using telemetry in canal and borewell systems.
- Promote drip irrigation
- Promote sorghum, pulses, oilseeds and horticulture through incentives and assured MSP

(ii) Restore Groundwater and Prevent Salinity

- Regulate ground water use for borewells in over-exploited blocks (CGWB classification)
- Recharge aquifers through
  - ➢ Check dams, percolation tanks and farm ponds
  - ➢ Rejuvenation of tanks (kere) under MGNREGA or state programs
- Promote organic mulching, cover crops, and zero tillage to protect soil from evaporation and salinity

(iii) Protect Bhimgad and Bhandura Nala (Stop Diversion of Bhandura Nala)

- Legally oppose the diversion under
  - ➢ Section 29 of the Wildlife Protection Act, 1972 (Bhandura originates in Bhimgad WLS).
  - ➢ Forest Conservation Act, 1980 – prohibits non-forest use of forest streams without clearance
  - ➢ UNESCO Convention on Biodiversity Hotspots – Bhimgad is in a declared heritage zone

(iv) Policy & Governance Measures

Action	Stakeholders
Not to permit diversion of Bhandura Nala from Bhimgad WLS	Chief Wildlife Warden of Bhimgad WLS & Karnataka Forest Dept.
Form a Western Ghats Hydrological Authority	MoEF&CC, Karnataka, Goa
Issue a Ban on Forest Diversions in Bhimgad-Mahadayi	National Board for Wildlife
Publish Eco-Flow Guidelines for all rivers in the Western Ghats	CWC, IWP, ATREE
Create a Malaprabha Water Tribunal to resolve intersectoral disputes	WRD, Agriculture, CADA, Farmers, WALMI
Include Malaprabha in Desertification Watch under UNCCD framework	MoEF&CC, NRSC

(v) Public Awareness

Conduct awareness campaigns regarding the risk of desertification among farmers, panchayats, sugarcane lobby, and students

(vi) Monitoring & Scientific Support

- Install rainfall and soil moisture sensors in 20 high-risk locations
- Partner with:
  - ➢ IISc Bengaluru for evaporation-rainfall feedback studies
  - ➢ NIH Roorkee and Belagavi for eco-flow modelling
  - ➢ ATREE & SACON for ecological health reports
- Publish annual "State of the Basin" report

(vii) Reforest and Restore the Malaprabha Catchment Area

Actions:

- Declare eco-sensitive zones around river origins of Malaprabha, Haltari, Bhandura, Haltara and Kalasa
- Launch Payment for Ecosystem Services (PES) schemes to incentivise forest protection by locals
- Ban commercial plantation (acacia, eucalyptus) and allow only native species regeneration
- Partner with ATREE / SACON / IISc for ecological restoration and monitoring.

To avert the crisis of dry and wet desertification in the Malaprabha sugarcane zone, a multi-pronged strategy must be adopted urgently . This involves hydrological restoration, policy correction, agricultural reform and legal safeguards, especially considering the ecological significance of the Bhimgad-Malaprabha–Mahadayi–Bhandura systems.

4. Desilting of Naviluteertha Dam

Desilting of Naviluteertha Dam (Malaprabha Reservoir) can significantly alleviate the water crisis in the Malaprabha basin and surrounding drought-prone areas such as Belagavi, Dharwad, Gadag and Bagalkot.

(i) Restoring Original Storage Capacity

- Current problem: The dam has lost significant live storage capacity due to sedimentation (silt deposited over decades)
- Impact: Even with good rainfall, the effective storage available for irrigation and drinking purposes is reduced
- Desiltation benefit: By removing silt, the dam can store more water—critical during dry seasons and droughts

Estimates:

- If ~10–15% of storage is lost to siltation (common in old reservoirs), this is 6 TMC of water
- Recovering this volume through desiltation directly adds to irrigation supply or drinking water availability

(ii) Improving Water Flow and Efficiency

- Silt-clogged sluices and canals reduce the efficiency of water distribution
- Desilting helps maintain clear channels and restores design flow rates, allowing better delivery to the often deprived tail-end regions like Ron, Nargund and Navalgund

(iii) Enhancing Agricultural Water Availability

- Sugarcane consumes ~120 TMC Malaprabha basin alone
- Desiltation can reallocate recovered capacity toward more equitable distribution, supporting diversified crops and mitigating wet desertification caused by the sugarcane mono-crop

(iv) Environmental and Groundwater Benefits

- Full reservoirs support percolation into groundwater aquifers improving well recharge downstream
- This helps reduce groundwater stress and promotes long-term water security

(v) Avoiding Expensive Diversion Projects

- If 6 TMC can be recovered via desilting, expensive and ecologically destructive options like Kalasa Bhandura Nala diversion from Mahadayi can be jettisoned
- Desiltation is cheaper and less controversial, and costs much lower. It can be linked to a local farmland soil restoration scheme or initiative

(vi) Silt Reuse for Agriculture and Construction

- Excavated silt is rich in nutrients; it can be distributed to farmers to improve soil fertility.
- This adds a soil restoration co-benefit to the desilting project.

Desilting the entire silt may be a stupendous task. However a moderate quantum of 1 to 2 TMC of phased desilting every year is achievable and affordable.

4.1 Ecological and Economic View

Option	Estimated Cost	TMC Yield	Ecological Impact
Desiltation of Naviluteertha	₹50–100 Cr	5–6 TMC	Low, positive impact
Bhandura diversion	₹800–1000 Cr	2.1 TMC	High, adverse impact (forest, wildlife, rainfall, Carbon sequestration)

Scientific/ Institutional References

1. NIH (Roorkee) and CWC sedimentation reports on aging dams in India
2. ATREE (2020) on water efficiency and siltation issues in the Western Ghats reservoirs
3. S. Viswanathan (2022): Discusses siltation and reservoir yield drop across Western Ghats
4. Karnataka WRD Siltation and Desilting Guidelines (2021)

4.2 Desilting of Naviluteertha Dam is a Low-cost High-impact Solution that can:

- Restore lost water capacity (5–6 TMC)
- Improve irrigation efficiency
- Recharge groundwater
- Delay or eliminate the need for ecologically risky diversion projects
- Revive downstream farming

Desilting vs Bhandura Diversion: A Comparative Analysis

Particulars	Desilting Naviluteertha Dam	Bhandura Nala Diversion
Purpose	Restore original capacity lost to siltation	Divert 2.18 TMC from Mahadayi basin (Bhandura Nala)
Estimated Water Yield	5-6 TMC (recoverable storage)	~2.1 TMC (diverted yield)
Capital Cost	₹ 50-100 crore (one-time, variable by method)	₹ 800-1000 crore (pipeline, pump house, forest clearance)
O&M Costs	Low (mostly civil works)	High (energy-intensive pumping, recurring costs)
Timeline	6-12 months (short gestation)	5+ years (clearances, construction, litigation)
Ecological Impact	Positive (revives percolation, improves soil fertility if silt reused)	High negative (forest clearance in Mahadayi WLS, reduced estuary flows, threatens biodiversity)
Legal Risk	Low (within reservoir area, minimal clearance)	High (Wildlife Protection Act section 29, inter-state tribunal, Supreme Court cases)
Inter-State Conflict	None	Severe: Goa and Maharashtra objections
Groundwater Benefit	Significant: promotes recharge	Negligible
Climate Adaptation Value	High (restores natural storage, improves resilience to rainfall variability)	Low (relies on engineering control, not storage restoration)
Public Resistance	Low	High
Silt Reuse	Fertile soil for farms; monetizable benefit	Not applicable
Carbon Footprint	Low	High (pumping, concrete, deforestation)
Cumulative Impact	Local restoration	Regional destabilisation of Western Ghats hydrology

Silting of the Naviluteertha Dam is a progressive phenomenon. Desilting has to be regulated to maintain the health and storage capacity of the reservoir. This prudent necessary action of desilting is not being done.

With a smaller budget, the Government can undertake desilting 2 TMC a year. This would lengthen the life of the dam and create 4 TMC of water storage, which otherwise, through Bhandura Nala diversion would take 4 years. This year (2025 monsoon) floodgates of the Naviluteertha Dam had to be opened, posing critical flood risk to Badami and downstream areas. The water could have been retained in the volume of silt in the reservoir thus averting the risk of flooding downstream.

Desilting of Naviluteertha Dam must be prioritised as a first-line, low-cost, ecologically sound alternative to the diversion of Bhandura Nala causing irreversible damage to Western Ghats. This approach not only restores lost capacity but also enhances climate resilience and avoids interstate conflict while supporting sustainable agriculture and drinking water access in the Malaprabha basin.

4.3 Siltation in Naviluteertha Dam

The estimated siltation in Naviluteertha Dam (Malaprabha Renukasagar reservoir) is significant and has reduced its effective live storage capacity. However, precise up-to-date figures are not publicly available in WRD portals after the 2010s. Based on available studies and analogues, we can derive a scientifically grounded estimate:

(i) Original Design Storage

- Gross storage capacity (1966): ~37.73 TMC (1069 MCM)
- Live storage: ~34.17 TMC
- Dead storage: ~3.56 TMC

(ii) Typical Siltation Trends in Indian Dams

According to:

- CWC (Central Water Commission) guidelines and surveys (2015)
- Research by NIH, Roorkee
- Studies from Karnataka's WRD

Most dams in the Deccan region lose 0.5–1% of gross storage per year to siltation, depending on:

- Catchment erosion (Western Ghats to semi-arid transition)
- Deforestation
- Reservoir age

(iii) Estimated Siltation in Naviluteertha (Since 1972)

Assuming ~0.6–0.8% silting loss per year over ~53 years

Siltation today (at.0.6% per year) is 32% which comes up to 12 TMC

- Actual available storage today may be closer to 22–25 TMC.
- Loss of ~12TMC affects:
  - ➢ Irrigation command area (~2.2 lakh hectares)
  - ➢ Tail-end talukas like Navalgund, Nargund, Ron
  - ➢ Drinking water to Dharwad, Hubali, Bagalkot towns

Scientific / Institutional References

- CWC Sedimentation Reports: "Compendium on Silting of Reservoirs in India" (2015)
- Karnataka WRD Project Atlas (older editions)
- NIH, Roorkee sedimentation norms for aging dams
- Viswanathan, S. (2020–22): Siltation + dryland water yield studies

(iv) Action Required

- Bathymetric survey to get precise current dead/live capacity
- Launch a desilting pilot phase (0.5 TMC/year target) using dredgers + farmer-silt reuse
- Jettison Bhandura and Kalasa diversion by restoring this lost 12 TMC potential

5. Potential Benefits of Harnessing Bennihalla

Bennihalla is a seasonal rivulet originating in Gadag district. It flows northeast and eventually joins the Malaprabha River. Its catchment receives ~500–600 mm rainfall annually. It is known for its flash floods during short monsoon spells followed by long dry periods

(i) Local Recharge & Surface Storage

- Check dams, tanks, and percolation ponds on Bennihalla can help recharge groundwater in arid talukas like Ron and Nargund
- Can aid drinking water and rabi crop irrigation (e.g. pulses, groundnut) in tail-end zones

(ii) Mitigation of Flash Flood Damage

- Harnessing Bennihalla can reduce monsoon erosion and water loss through runoff
- Helps moderate soil degradation and silt transport into Malaprabha

(iii) Conjunctive Use Strategy

- Harnessed Bennihalla water can be integrated with treated wastewater from Gadag/Nargund towns to recharge tanks or fill canals

(iv) Local Resilience

Particulars	Value or Impact
Estimated Annual Yield	~3-4 TMC (varies with rainfall)
Useful for	Drinking water, local recharge, minor crops
Not suitable for	Large-scale irrigation (e.g., sugarcane)
Seasonal Availability	June-September (short-lived)
Strategic Role	Local resilience only, not basin-scale

Strategic Use of Bennihalla should be:

- Harnessed through decentralised rainwater harvesting (check dams, recharge shafts)
- Integrated into village/taluka water security plans such as Jal Shakti Abhiyan, Atal Bhujal Yojana etc.
- Avoid major diversions or irrigation promises for cash crops like sugarcane

Harnessing 2 TMC from local seasonal streams like Bennihalla is a far better, more sustainable and ecologically safe option than diverting water from the Bhandura Nala (Mahadayi basin).

Illustrative Comparative Evaluation Table
Bennihalla (Local Option) vs Bhandura (Inter-basin Diversion)

Aspect	Bennihalla (Local)	Bhandura Diversion (Mahadayi)
Source Basin	Malaprabha (intra-basin)	Mahadayi-Mandovi (ecologically sensitive, Goa's lifeline)
Quantum Targeted	~2 TMC (achievable through local storage/recharge)	1.72-2 TMC officially, but threatens larger ecological flows
Impact on Downstream	Minimal (if recharge-based)	Severe: Affects Goa's forests, rivers, estuaries, fisheries
Ecological Impact	Positive: Soil moisture, aquifer recharge	Negative: Deforestation, dry river stretches, estuary salinization
Legality / Conflict	Within Karnataka; no interstate legal dispute	Under legal dispute with Goa; violates Wildlife Protection Act
Feasibility	Technically simple: check dams, farm ponds, tanks	Complex diversion with tunnels and forests to be cleared
Cost	Low: ~₹100-150 crore (cluster of decentralized projects)	High: ₹850+ crore (Bhandura-Kalasa infrastructure)
Rain Dependence	Seasonal, but suited for demand management and recharge	High rainfall, but removal affects a monsoon catchment
Strategic Suitability	Excellent for drought-proofing Ron, Nargund, Navalgund	Unsuitable: water leaves an already stressed eco-zone

5.1 Bennihalla is better for the Following Reasons:

(i) No Inter-basin Transfer

- Keeps water within the Malaprabha catchment; aligns with natural hydrology and equity

(ii) No Violation of Wildlife Laws

- Bhandura passes through Bhimgad Wildlife Sanctuary contravening Section 29 of the Wildlife Protection Act
- Bennihalla has no such ecological conflict

(iii) No International or Inter-State Legal Issue

- Bhandura diversion affects Goa's protected estuaries (UNESCO hotspot) with international implications
- Bennihalla is completely intra-state and low-risk

(iv) Ecosystem Restoration Bonus

- Harnessing Bennihalla with check dams, vegetative bunds, and farm ponds improves:
  - ➢ Soil moisture
  - ➢ Local aquifers
  - ➢ Green cover
- Bhandura diversion will destroy forests and dry downstream stretches

The most effective way forward for Karnataka to address the water "deficit" is:

1. Harness 2 TMC from intra-basin sources (Bennihalla, minor nalas and treated wastewater reuse)
2. Reduce water demand by improving sugar-cane irrigation efficiency
3. Protect the Western Ghats and avoid international ecological embarrassment

5.2 Reasons for ignoring Bennihalla

Reason Type	Root Cause
Political	Mega projects get votes, media and ribbon-cutting opportunity.
Economic	Bennihalla is too decentralized for vested interests
Bureaucratic	Siloed departments, no recharge master plan
Psychological	Seen as minor stream, not a viable basin-level intervention
Institutional	No strong policy enforcement on demand management
Advocacy Gap	Lack of NGO/scientific pressure in north Karnataka
Ecological Blindness	**Misbelief that the Western Ghats have "surplus water"**

(i) Political Optics: Big Projects Translate into Big Visibility

- Mega projects like Kalasa–Bhandura diversions attract political attention and can be marketed as flagship achievements, even if ecologically disastrous
- In contrast, decentralized recharge across Bennihalla basin appears "small" and not vote-catching
- Politicians often prefer visible canals, tunnels, and dams over invisible recharge or local tanks

(ii) Misplaced Notion of Surplus water in Western Ghats

- Officials and most engineers believe Western Ghats equates to surplus water, so diverting a "small amount" from Bhandura is harmless.
- They ignore or are oblivious to the ecological services and the estuarine dependency of the monsoon in the region

6. Diverting Bhandura Nala is NOT a Solution

(For averting the Dry/ Wet Desertification of Malaprabha Basin)

Diverting Bhandura Nala is not a sustainable or justifiable solution to the water stress or gross mismanagement caused by sugarcane overexpansion in the Malaprabha basin. It would exacerbate ecological, hydrological and legal problems—while allowing the real culprits (sugarcane overuse, poor crop planning and political capture of water) to continue unchecked.

Such an initiative:

(i) Creates Dangerous Precedents

- Allows maladaptive agriculture to be sustained by sacrificing ecological regions
- Encourages further diversions instead of solving water misuse at source

(ii) Does NOT Address Root Cause

- Malaprabha is stressed not due to lack of water, but due to mis-allocation
  - Over 120 TMC annually is used by sugar-cane alone
  - **Diverting 2.18 TMC from Bhandura will not solve the structural problems**

(iii) Accelerates Desertification in Western Ghats & Goa

- Reduced streamflow → less recharge → less evapotranspiration → reduced rainfall
- Long-term drying of both Western Ghats and eastern rain-shadow zones
- Scientific studies (e.g., S. Viswanathan, 2022) link such diversions to wet desertification

Diverting Bhandura Nala is a short-sighted, ecologically destructive, and legally unsound move. It is like treating cancer with painkillers; akin to administering symptomatic relief while the disease grows.

6.1 Diverting Bhandura could Worsen Hydrological Imbalance and Hasten Desertification

Diverting Bhandura Nala is not a real solution to the water shortage in Ron and Nargund. It could worsen the hydrological imbalance and accelerate desertification in the Malaprabha basin.

(i) Geographical Mismatch: Bhandura is not Malaprabha Sub-Basin

- Bhandura Nala originates in the Mahadayi basin and does not naturally drain into the Malaprabha
- Diverting its water via tunnels or canals involves inter-basin transfer —an ecologically destructive and hydrologically inefficient process

(ii) Water Will Not Reach Ron, Nargund Areas

- The diverted water is meant to augment the existing Malaprabha reservoir (Naviluteertha).
- But as seen earlier, water from the dam:
  - Never reaches Ron/ Nargund reliably
  - Is monopolized by upstream sugarcane zones (Saundatti, Bailhongal)
  - Gets lost through leakages, evaporation and mismanagement in canals

So even if 2.18 TMC is added from Bhandura, it will not physically flow to the tailend talukas

(iii) Too Little Water to Make a Difference

- Bhandura Nala's yield is <3 TMC/year — a tiny fraction of:
  - Malaprabha's demand (~145–180 TMC)
  - Sugarcane consumption (~120–150 TMC)
- This is not a meaningful or sustainable addition for systemic shortages

(iv) Ecological Damage

- It destroys forest hydrology, monsoon stability, and biodiversity — ultimately affecting regional rainfall patterns across Malaprabha basin

(v) False Narrative: Divert to Solve Tail-End Drought

- The real solution lies in correcting upstream overuse, not diverting new water:
  - Sugarcane and factories corner the water
  - Diverted water will also be consumed before it gets to Ron or Nargund
- This is political eyewash, not hydrological justice

Diversion is Distraction, Not Solution

Diverting Bhandura is like pouring a bucket of water into a cracked tank. The water will vanish long before it reaches the tail-end users. Instead of irreversible ecological damage for a tiny gain, the State must fix distributional injustice, promote demand-side solutions and hold the political-industrial-sugarcane nexus accountable.

Is Diversion of Mahadayi A Solution ?

4 TMC

Rain Yield
322 TMC

Mahadayi Diversion

OR

67
TMC

II

Desilting
Renukasagar Reservioul
12 TMC
Storage

+

Drip and water efficient
Package of Practices for
Sugarcane *(Annexture ix)*
55 TMC
Saving

137 TMC
Mismanaged
For
Sugar &
Ethanol

Malaprabha Basin

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Abbreviations

ATREE	Ashoka Trust for Research in Ecology and the Environment
BARC	Bhabha Atomic Research Centre
CADA	Command Area Development Authority
CAIDA	Centre for Applied Internet Data Analysis (context-dependent)
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CCN	Cloud Condensation Nuclei (or Climate Change Network – context-dependent)
CGWB	Central Ground Water Board
CO_2	Carbon Dioxide
COP	Conference of the Parties (to UNFCCC)
CSR	Corporate Social Responsibility
CWC	Central Water Commission
DPR	Detailed Project Report
EIA	Environmental Impact Assessment
ESA	Ecologically Sensitive Area
ESZ	Eco-Sensitive Zone
FHTC	Functional Household Tap Connection
FRL	Full Reservoir Level
ft	Feet
ha	Hectare
HLWG	High-Level Working Group
IARC	International Agency for Research on Cancer
IISc	Indian Institute of Science
IIT	Indian Institute of Technology
INM	Integrated Nutrient Management
IUCN	International Union for Conservation of Nature
IWP	India Water Portal
JJM	Jal Jeevan Mission
KAMIC	Karnataka Antaraganga Micro Irrigation Corporation
Km^2	Square Kilometre
KNO_3	Potassium Nitrate
KREDL	Karnataka Renewable Energy Development Limited
KSNDMC	Karnataka State Natural Disaster Monitoring Centre
LBC	Local Biodiversity Committee
m^3	Cubic Meter
MCM	Million Cubic Meters

MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
$MgSO_4$	Magnesium Sulphate
MoEF&CC	Ministry of Environment, Forest and Climate Change
NaCl	Sodium Chloride
NAPCC	National Action Plan on Climate Change
NBWL	National Board for Wildlife
NGT	National Green Tribunal
NH4Cl	Ammonium Chloride
NIH	National Institute of Hydrology
NIVA	Norwegian Institute for Water Research
NMMI	National Mission for a Million Trees Initiative
NRSC	National Remote Sensing Centre
OUV	Outstanding Universal Value
Pg	Page
PES	Payment for Ecosystem Services
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana
PWV	Perceptible Water Vapour
SAC	Space Applications Centre
SACON	Sálim Ali Centre for Ornithology and Natural History
SCNBWL	Standing Committee of National Board for Wildlife
SND	Sediment
SOC	Soil Organic Carbon
TMC	Thousand Million Cubic Feet
TN	Tamil Nadu
UNCCD	United Nations Convention to Combat Desertification
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WALMI	Water and Land Management Institute
WGEEP	Western Ghats Ecology Expert Panel
WLS	Wildlife Sanctuary
WRD	Water Resources Department
WRIS	Water Resources Information System
wrt	With Respect To

Annexure

Irreversible Damage and the Precautionary Principle

In environmental science and law, *irreversible damage* refers to harm that once inflicted cannot be undone or restored within a human timescale.

Examples of such a damage include:

- Extinction of species
- Permanent alteration of ecosystems and loss of biodiversity
- Salinization or desertification of fertile lands
- Groundwater depletion beyond recharge capacity
- Large-scale deforestation and climate tipping points

Such damages are considered critical because natural systems often have thresholds which once crossed, their recovery is impossible or prohibitively costly. For example, species extinction is permanent, and contaminated aquifers may remain unsafe for centuries.

The precautionary principle is a cornerstone of international environmental law. The Rio Declaration of 1992 states, "When there is risk of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation." The principles key elements are:

- Anticipatory action: Act before harm occurs
- Burden of proof: Shifts responsibility to proponents of an activity to show it is safe
- Risk avoidance: Especially when consequences are unknown or potentially catastrophic
- Prioritising sustainability: Long-term ecological health over short-term economic gain

Because irreversible damage cannot be remedied, the precautionary principle is invoked as a safeguard. In practice, it means *decision-makers must err on the side of caution* in approving projects or policies with uncertain but potentially grave ecological impacts. For example, dams affecting river ecosystems, genetic modification of crops, large-scale deforestation, hazardous waste disposal etc. It embodies the ethic of "better safe than sorry" in environmental governance, ensuring that ecological assets are not gambled away in pursuit of short-term gains.

The **Precautionary Principle** is now recognised as a key component of international and Indian environmental law. **The Rio Declaration on Environment and Development** (1992), Principle 15 states, "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." This emphasises anticipatory action, risk avoidance, and shifting the burden of proof onto the developer.

The Supreme Court of India has read the precautionary principle into Article 21 (Right to Life). In the Vellore Citizens' Welfare Forum vs. Union of India (1996)

case, the court declared the precautionary principle as part of Indian environmental law. In the A.P. Pollution Control Board vs. Prof. M.V. Nayudu (1999) case, the court stressed that when scientific uncertainty exists, decision-makers must adopt precautionary measures to protect the environment.

The **Bhandura Nala Diversion Project**, originally justified as a drinking water scheme, in practice, diverts water from the Mahadayi basin to irrigate sugarcane cultivation. This diversion entails the risk of serious and irreversible ecological damage, such as:

- Loss of river flows into Bhimgad Wildlife Sanctuary and Tiger Corridor – affecting habitat connectivity critical for large mammals. Once fragmented, these ecological corridors cannot be restored.
- Permanent alteration of hydrology – diversion reduces downstream availability, leading to groundwater depletion, wetland shrinkage, and collapse of riverine ecosystems.
- Biodiversity loss – rare and endemic species in Western Ghats streams depend on continuous water flow; extinction or habitat collapse is irreversible.
- Desertification and soil salinization – excessive diversion for sugarcane irrigation risks permanent loss of agricultural productivity downstream.

These impacts, once triggered, cannot be undone even with later remedial measures.

- The diversion lies within 2 km of Bhimgad Wildlife Sanctuary and its tiger corridor, a fact not properly disclosed in Parivesh documentation. Non-disclosure violates both EIA safeguards and the precautionary principle.
- Claiming "drinking water" while directing water to sugarcane factories contravenes the National Water Policy (2012), which prioritizes drinking water over irrigation. Misrepresentation of purpose undermines the legal justification of the project.
- Given the risk of irreversible ecological damage (forest fragmentation, biodiversity decline, aquifer stress), the project should be abandoned.

By altering river flows in ecologically fragile zones adjoining protected areas, the Bhandura Nala Diversion Project poses a high risk of irreversible damage.

Under the precautionary principle, recognised by Indian courts as a binding law, such a project cannot be justified merely on the basis of 'drinking water need' or incomplete environmental assessment. Preventive action, re-evaluation of alternatives, and full compliance with wildlife and water policy safeguards are essential before proceeding further.

Where irreversible loss is likely, precaution is not optional but mandatory.

Precautionary Principle : MoEF & CC/EAC E-Flow Norms Accepted by CWC

Critical Location of Bhandura Diversion Dam

The proposed **Bhandura Diversion Dam** lies **barely 2 km from the boundary of Bhimgad Wildlife Sanctuary**, an eco-sensitive zone forming the headwaters of the **Mahadayi/Mandovi river system**. This region acts as a **"moisture pump" forest**, recycling monsoon humidity and sustaining rainfall across **North Karnataka's semi-arid districts** (Belagavi, Dharwad, Gadag, Bagalkot). Any diversion or fragmentation in this headwater zone risks disrupting the forest–rainfall feedback loop that maintains local and regional hydrological balance.

Given the dam's proximity to a **Protected Area** and its functionally critical role in sustaining downstream ecology, the project must be governed by the **Precautionary Principle** under the Environment (Protection) Act, 1986, and adhere strictly to **MoEF & CC's Environmental Flow (E-flow) norms**—maintaining **not less than 30 % of the natural monsoon flow** even under **90% dependable year conditions**, and ensuring continuous minimum flow through the non-monsoon season.

Applying higher dependability (90%) and E-flow safeguards is essential to prevent **irreversible ecological degradation** of Bhimgad Sanctuary, **loss of the monsoon-generating forest canopy**, and **decline in rainfall and groundwater recharge** across the Malaprabha–Ghataprabha basins.

The MoEF & CC/EAC e-flow rule

For River Valley / diversion projects, the Standard ToR repeatedly requires releases referenced to a **90% dependable year**:

- **Monsoon: 30%** of average monsoon flow
- **Lean (four consecutive lean months): 20%** of flow
- **Other months (non-monsoon & non-lean): 25%** (site-specific within 20–30%) These figures appear consistently in recent EAC minutes/ToR summaries and PIB answers.

Note: NGT has separately directed that states ensure **15–20% of *average lean* flow** as an absolute minimum; EAC/ToR is stricter because it pegs % to the **90% dependable year** and adds **30% for monsoon**.

These correspond to what has been used in prior EIA conditions under MoEFCC / EAC.

The flows after Bhandura Nala diversion as per 90% dependability is as follows

DPR monsoon yield @75% (TMC)	75%-90% factor	Monsoon flow @90% (TMC)	Diversion in monsoon (TMC)	Gap vs DPR proposal (2.18 TMC)	Monsoon e-flow 30%
2.62	0.75	1.965	2.18	-0.805	No Flow

This clearly indicates 2.18 TMC is an over estimated diversion

References & Citations

Particulars	Flow Requirements	Source / citation
64th EAC meeting (River Valley & Hydro)	"Minimum environmental flow release … 20% of average of four months of lean period and 20% to 30% of flows during non-lean & non-monsoon period corresponding to 90% dependable year. … cumulative releases in monsoon ~ 30% of cumulative inflows during monsoon (90% dependable year)."	Minutes, 64th EAC meeting Environment Clearance

Particulars	Flow Requirements	Source / citation
5th EAC meeting	"The minimum environmental flow shall be 20% of the flow of four consecutive lean months of 90% dependable year, 30% of the average monsoon flow. The flow for remaining months shall be in between 20-30%, depending on the site specific requirements. A site specific study shall be carried out by an expert organization."	Minutes, 5th EAC meeting (River Valley) Parivesh
11th EAC meeting	Recommends: "minimum environmental flow shall be 20% of the flow of four consecutive lean months of 90% dependable year, 30% of the average monsoon flow. The flow for remaining months shall be in between 20-30%, depending on the site specific requirements."	Minutes, 11th EAC meeting Parivesh
EAC / MoEF historic norm (Gondhala HEP et al.)	The EAC (in earlier meetings) suggested that "minimum Environmental Flow release should be 20% of the average of the four lean months of 90% dependable year. In non-monsoon non-lean season the release should be between 20-30% … The environmental releases/spill during the monsoon season should be 30% of average monsoon flow …"	MoEF / EAC decisions (compilation) prod-qt-images.s3.amazonaws.com+1
Rongnichu HEP EC conditions	The EC document indicates the project proponent submitted e-flow assessments as per TOR: 30% (Monsoon season), 20% (Lean season) and 20% (Non-monsoon & Non-lean season)	Rongnichu HEP EC order / environmental clearance document spcb.sikkim.gov.in
NGT direction / PIB on e-flow	The National Green Tribunal in OA 498/2015 directed all States to maintain a minimum e-flow of 15–20 % of the average lean season flow in their rivers. Press Information Bureau	

Key Documents & Excerpts

1. **Minutes of 5th EAC meeting (River Valley & Hydroelectric Projects)**
   - PDF: "Minutes of the 5th Meeting …" *Environment Clearance*
   - On p. __ (opening pages) it states:

   "The minimum environmental flow shall be 20% of the flow of four consecutive lean months of 90% dependable year, 30% of the average monsoon flow. The flow for remaining months shall be in between 20-30%, depending on the site specific requirements." *Environment Clearance*
   - This is exactly the formula used in EAC/ToR practice. *Environment Clearance*
2. **Minutes of 35th EAC meeting (River Valley & Hydroelectric Projects)**
   - PDF: "The 35th meeting …" *Parivesh*
   - On page 19, under hydrology / e-flow conditions, it states:

   "The minimum environmental flow shall be 20% of the flow of four consecutive lean months of 90% dependable year, 30% of the average monsoon flow. The flow for remaining months shall be in between 20-30%, depending on the site specific requirements. A site specific study shall be carried out by an expert organization." *Parivesh*
3. **Rongnichu HEP (115 MW) — Environmental Clearance document (Sikkim)**
   - PDF EC: "Rongnichu HEP [115 MW]" *spcb.sikkim.gov.in*
   - In its conditions / EAC's requirement section, it references the same 20% lean, 30% monsoon basis, and requires a "site-specific study" for non-monsoon months. *spcb.sikkim.gov.in*
4. **EAC minutes / ToR norms referred in older decisions**
   - In the 76th EAC meeting minutes, referencing earlier 64th EAC minutes, it states:

   "The minimum environmental flow shall be 20% of the flow of four consecutive lean months of 90% dependable year, 30% of the average monsoon flow. The flow for remaining months shall be between 20-30% depending on the site specific requirement." *Environment Clearance*
   - This shows continuity in normative usage. *Environment Clearance*
5. **Guidance document — National Mission for Clean Ganga / E-flow guidance (2013)**
   - PDF: "IEWP E-Flows Guidance Doc" (NMCG) *nmcg.nic.in*
   - It states that lean season e-flows are kept as 20% of average flow of four leanest months in 90% dependable year. *nmcg.nic.in*

The Butterfly Effect

Flapping of a butterfly's wings in Brazil could set off a tornado in Texas.

The term was popularized by meteorologist **Edward Lorenz** in the 1960s, who discovered that tiny variations in input data could drastically change the outcomes of his weather models.

The **butterfly effect** is a concept from chaos theory that describes how **small changes in initial conditions can lead to disproportionately large consequences** in complex systems.

In nonlinear systems like climate, ecology, or hydrology, even minor disturbances can cascade through reinforcing feedback loops and produce large-scale outcomes. In ecology the butterfly effect is essentially, **"ecological tipping points"**: Small disruptions in keystone species, habitat patches, or climate drivers can **amplify through food webs and hydrological cycles**, reshaping entire landscapes.

Below are a few real-life examples where the ***Butterfly Effect*** is visible in water, ecology, and climate systems.

I) Aral Sea (Central Asia)

- *Small Trigger*: In the 1960s, the Soviet Union diverted rivers (Amu Darya & Syr Darya) for cotton irrigation.
- *Cascading Effect*: What seemed like a "local agricuitural adjustment" led to one of the world's worst environmental disasters.
  - ➢ Aral Sea lost **90% of its volume**.
  - ➢ Fisheries collapsed, dust storms increased, and regional climate warmed/dried.

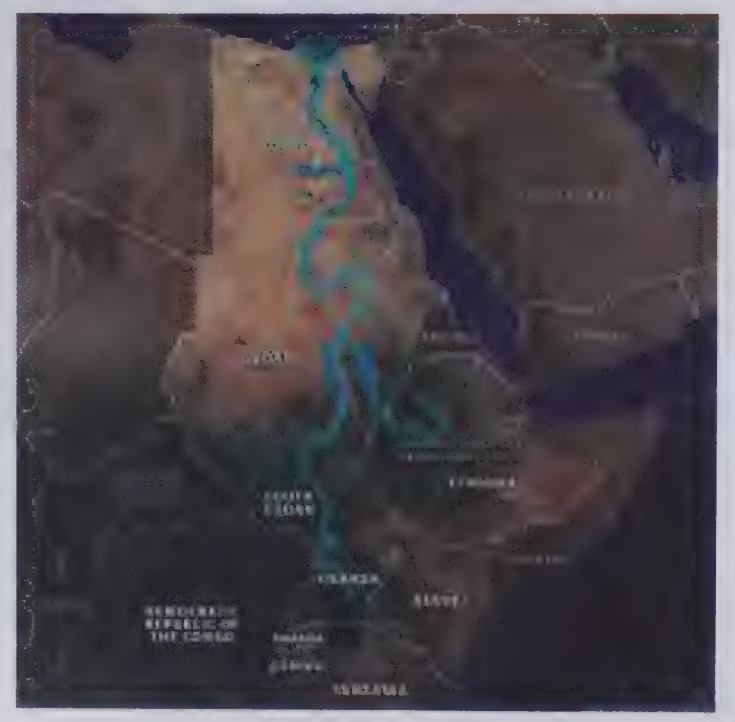
- ***Outcome:*** ⊡ Small river diversions → collapse of a sea and regional desertification.

2. **Amazon Deforestation (Brazil)**
   - *Small Trigger*: Logging or clearing a few hundred hectares for cattle ranching.
   - *Cascading Effect*:
     - Reduced evapotranspiration reduces local rainfall.
     - Over decades, forest loss may flip the Amazon into a **savannah-like ecosystem**.
     - Global impact: weakened carbon sink, worsening **climate change** worldwide.
   - ***Outcome:*** Local tree-cutting → global rainfall and climate shifts.

3. **Colorado River Diversions (USA/Mexico)**
   - *Small Trigger*: Expanding irrigation in the upper basin seemed manageable.
   - *Cascading Effect*:
     - Today, the Colorado River **rarely reaches the sea**.
     - Estuarine wetlands in Mexico have collapsed.
     - Species dependent on the delta declined, and salinity rose in irrigated areas.

   - ***Outcome:*** → Local irrigation diversions → cross-border ecological collapse.

4. **Nile River Regulation (Africa)**
   - *Small Trigger*: Construction of the Aswan High Dam (1970).
   - *Cascading Effect*:
     - Stopped natural silt deposition in Egypt.
     - Increased fertilizer dependence, eroded delta, and caused salinity intrusion from the Mediterranean.
   - ***Outcome:*** Local control of seasonal floods → long-term soil and coastal degradation.



5. **Lake Chad Shrinkage (Africa)**

- *Small Trigger*: Small increases in irrigation withdrawals during dry years.
- *Cascading Effect*:
  - Lake Chad has **shrunk by 90% since the 1960s**.
  - Led to collapse of fisheries, displacement of millions, and conflicts (e.g., farmer-herder clashes, Boko Haram recruitment conditions).
- Outcome: [→] Modest irrigation withdrawals → regional humanitarian crisis.

6. **Yangtze River & Three Gorges Dam (China)**

- *Small Trigger*: One dam to regulate floods and generate power.
- *Cascading Effect*:
  - Altered fish migration, reduced sediment reaching East China Sea.
  - Increased erosion, landslides, and reduced downstream fertility.

  Local hydropower project → basin-wide ecological disruptions.

The image below gives an illustration of the extent of the environmental effects. Here we can see how far up the mountain sides the reservoir extends and thus how much land is affected by landslides and erosion, which ultimately stem from water-caused degradation.

7. **Rainforest–Rainfall Feedback**
   - *Case:* Deforestation in Amazon
   - *Butterfly effect:* Local tree removal →
     - Less transpiration and cloud formation
     - Regional rainfall declines
     - Forest desiccation → more fire risk
     - Reinforcing loop leading to desertification risk in surrounding regions.

Here, *small-scale forest loss* can tip the climate–ecology balance over large regions

The Rainforests in South America are burning this year faster than ever before, setting the course for a collapse of the Amazon in the coming decades.

Yettinahole Project: A Small Intervention in a Complex System

The **Yettinahole Integrated Drinking Water Project**, located in the Western Ghats of Karnataka, to divert about **24 TMC of monsoon water** from headwater streams (tributaries of the Netravathi River) to drought-prone districts in eastern Karnataka (Kolar, Chikkaballapur, Tumakuru, etc.). On the surface, this appears as a **limited intervention**—merely lifting and transferring seasonal floodwaters.

*Yet, just like in Lorenz's weather models, the hydrological and ecological systems of the Western Ghats and Deccan plateau are **nonlinear and deeply interdependent**. The butterfly effect metaphor helps us understand how **small shifts in flow** here ripple across ecological, social, and climatic domains.*

Cascading "Butterfly Effects" of Yettinahole

1. **Hydrological Ripple**
   - Even modest reduction of streamflow in Netravathi tributaries alter sediment transport, groundwater recharge, and baseflow patterns downstream
   - Over decades, this will influence estuarine salinity balance and coastal fisheries.
2. **Ecological Cascade**
   - Headwater streams of the Western Ghats sustain amphibians, fish, and riparian forests highly sensitive to flow regime changes
   - A seemingly small diversion disturb breeding cycles, which then ripple through the food web, altering ecosystem stability.

3. **Climatic Feedback**
   - Reduced downstream flow → less wetland and estuarine evapotranspiration → subtle shifts in local humidity and rainfall recycling.
   - Over decades, *this reinforces regional rainfall decline*, **much like a butterfly's wing beat,** escalating into a storm in Lorenz's model.
4. **Rain Feedback**

   The **removal of a few small Western Ghat headwater streams** under Yettinahole can ripple outward:
   - From **local canopy loss in Hassan/ Chikkamagaluru** →
   - To **regional rainfall weakening in Central Karnataka** →
   - To **accelerated desertification across interior Region**

Just as Lorenz showed that **small, almost invisible changes can spiral into major weather events**, the Yettinahole project demonstrates how **a limited diversion at the source can have unpredictable, amplified outcomes across entire river basins**.

*The **butterfly effect lens** cautions policymakers that interventions in sensitive ecosystems like the Western Ghats must be evaluated not only for immediate benefits, but also for **long-term nonlinear consequences** that may be difficult to reverse once triggered.*

The Parallel with Bhandura Nala

A diversion here may seem "small" in volumetric terms (≈ 2.18 TMC out of ~2.4 TMC dependable yield), it is a **headwater in a sensitive system (Western Ghats)**. Because of the **sensitive, non-linear, and interconnected system**, the consequences amplify across scales.

Diversions cascade through **ecological, hydrological, and climatic loops**, much like the **Aral Sea, Colorado, Nile, Yettinahole examples**.

Systems Loop Dynamics (Butterfly Effect)

Three reinforcing loops emerge:

1. **Forest–Rainfall Loop (+)**
   Diversion → forest loss → reduced evapotranspiration → less rainfall → further forest decline.
2. **River–Estuary Loop (+)**
   Diversion → less downstream flow → more salinity in estuaries → less evaporation & convection → weaker monsoon → drier Ghats.

3. **Dryland–Groundwater Loop (+)**

   Less rainfall in N. Karnataka → less river inflow (Malaprabha/Ghataprabha) → more borewell extraction → aquifer depletion → wet desertification → rainfall decline.

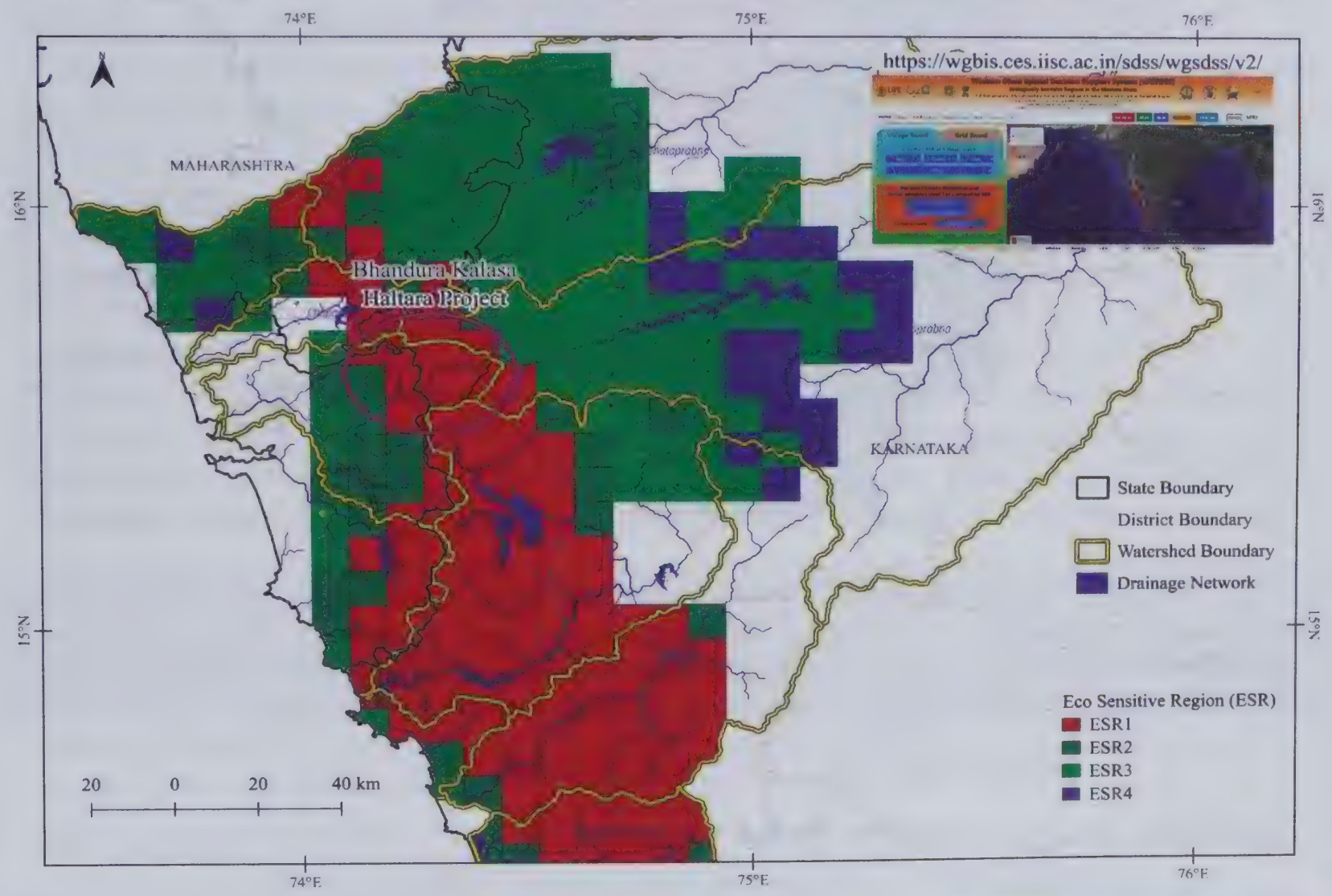
*Each loop is **self-reinforcing (+)**, showing how a small headstream diversion can scale up to a **regional desertification crisis**.*

Kalasa Bhandura Diversion Project: Work in Eco Sensitive Zone 1

IISc – Energy & Wetlands Research Group

Ecological Insights of Northern Karnataka River basins, Central Western Ghats, Karnataka and Goa

IISc-EIACP, Energy & Wetlands Research Group
CES TE15, Third Floor, E Wing, New Biology Building [Near D Gate]
Indian Institute of Science, Bangalore, India – 560012
Web: https://wgbis.ces.iisc.ac.in, E Mail: tvr@iisc.ac.in | Tel: 080-22933099/2293 3503/23608661



Assessment based on three decades of Research in Western Ghats

Website: https://wgbis.ces.iisc.ac.in | Email: envis.ces@iisc.ac.in, tvr@iisc.ac.in
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IISc – Energy & Wetlands Research Group

Ecologically Sensitive Regions (ESR) in Northern Karnataka River basins, Central Western Ghats

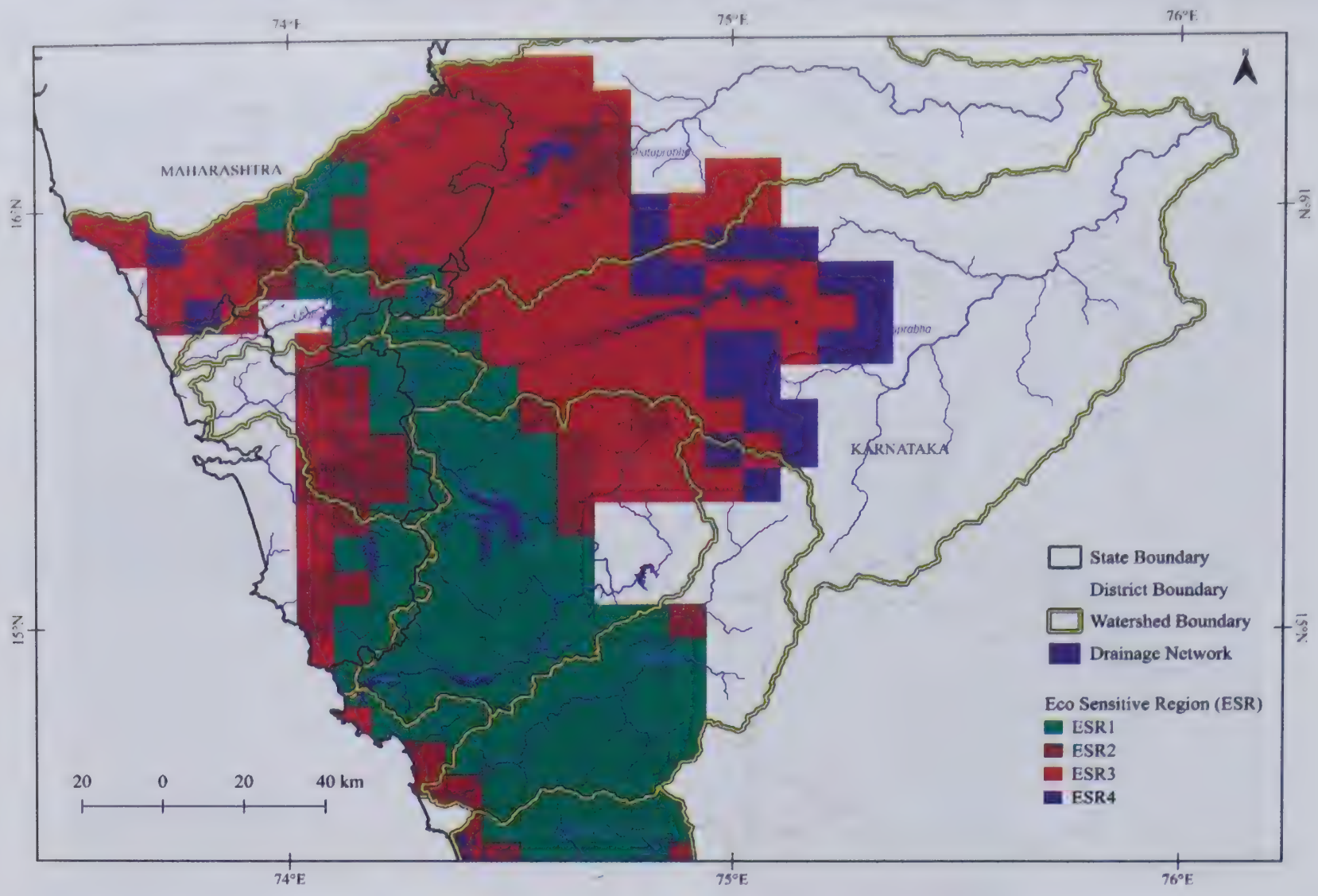

Fig 1. Eco-Sensitive Regions (ESR) in Northern Karnataka River basins, Central Western Ghats (prioritized considering bio-geo-climatic, ecological, environmental and social parameters) based on Western Ghats Spatial Decision Support System (WGSDSS) - Ecologically Sensitive Regions in the Western Ghats (https://wgbis.ces.iisc.ac.in/sdss/wgsdss/v2/)

Indian Forest Act, an "Eco-Sensitive Zone" (ESZ)

Guidelines for **Eco-Sensitive Zones** as per the Ministry of Environment, Forest and Climate Change, Govt of India (MoEFCC 2011)

The National Environment Policy (2006) defined the Eco-Sensitive Zones "as areas/zones with identified environmental resources having incomparable values which require special attention for their conservation" because of its landscape, wildlife, biodiversity, historical and natural values.

The National Wildlife Action Plan (NWAP) (2002-2016) indicated that 'Areas outside the protected area network are often vital ecological corridor links and must be protected to prevent isolation of fragments of bio-diversity which will not survive in the long run. Land and water use policies will need to accept the imperative of strictly protecting ecologically fragile habitat and

regulating use elsewhere'. The action plan also indicated that 'all identified areas around protected areas and wildlife corridors to be declared as ecologically fragile under the Environment (Protection) Act, 1986.

The activities in the ESZ are generally regulated and not prohibitory in nature barring a few such as (i) commercial mining, stone quarrying and crushing units; (ii) major hydroelectric project; (iii) handling of hazardous substances; (iv) discharge of untreated effluents; (v) setting up of brick kilns; (vi) setting up of polluting industries, which have high potential for environmental damage.

Statutory Provisions [1,2,3]

Section 3 of the Environment (Protection) Act 1986 (EPA) gives power to the Central Government i.e. the Union Ministry of Environment and Forests to take all measures that it feels are necessary for protecting and improving the quality of the environment and to prevent and control environmental pollution. To meet this objective, the Central Government can restrict areas in which any industries, operations or processes or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards [Section 3(2)(v)]

Section 5(1) of the Environment (Protection) Rules, 1986 (EPR), states that the central government can prohibit or restrict the location of industries and carrying on certain operations or processes on the basis of considerations like the biological diversity of an area (clause v) maximum allowable limits of concentration of pollutants for an area (clause ii) environmentally compatible land use (clause vi) proximity to protected areas (clause viii).

Benefit of Eco-Sensitive Regions (ESR) in Livelihood of people

Water Availability in streams throughout the year – Where waterbodies are perennial, farmers grow multiple cash crops earning Rs. 154000 per acre per year. In contrast to these, farmers in degraded catchment area grow only one crop with water availability of 4 to 6 months and earn only Rs. 32000 per acre per year [4].

High yield of crops – Due to the presence of diverse abundant pollinators crop yield is high in the vicinity of native species forests. For example, yield of paddy is 14 to 18 quintal per acre in the vicinity of native species forests compared to yield of paddy in degraded catchment is 6 to 8 quintal per acre [5].

If, Government of India desires to double the income of the farmers, best approach in this regard are to maintain the ecological integrity of the catchment for sustaining the hydrological regime and livelihood of framers – children of Western Ghats.

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   https://cpc.parivesh.nic.in/writereaddata/Guidelines_for_EcoSensitive_Zones_around_Protected_Areas.pdf
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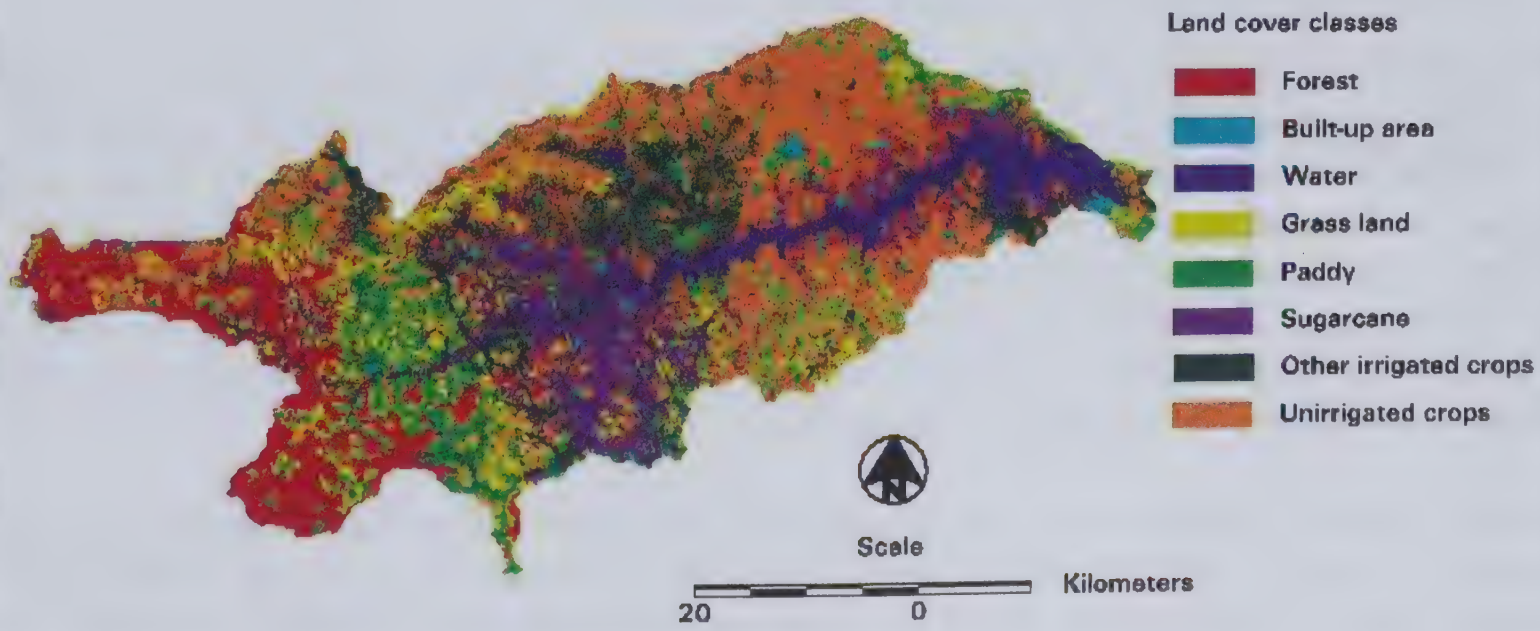
REPORT SNO 5695-2008

Hydrology and Water Allocation in Malaprabha

Comprehensive database and integrated hydro economic model for selected water services in the Malaprabha river basin



Summary

Malaprabha river basin has been the study area for the development of comprehensive database on the status of water sector and the development of integrated hydro economic model for selected water services. Malaprabha river is a tributary river to the Krishna river and flows through the state of Karnataka in India. Malaprabha dam is constructed in the stream with a live storage capacity of 870 MCM to meet the irrigation demand in the area as well as to supply drinking water to the nearby towns. Catchment area of the Malaparbha dam is 2204 km^2, which is divided into 3 main hydrological zones: upper catchment (zone-1), middle catchment (zone-2) and lower catchment (zone-3). Due to variation in the hydro-meteorological characteristics and unsustainable land-use practices, the area is experiencing water stress across all sectors, thereby making the inter-sectoral water allocation a challenging issue. Almost 80% of the monsoon river flow is generated from zone-1. On the other hand, almost 60% of the post-monsoon runoff is generated from zone-2 and zone-3. Most of this water is extracted for irrigation in zones-2 and zone-3, which were traditionally rainfed areas, but now under extensive irrigation thereby resulting in water scarcity in the area.

For studying the feasibility of Payment for Watershed Services (PWS) to improve the water availability, in this study a detailed analysis of the historic hydrologic was carried out and a framework of hydrologic and water allocation model is developed. A detailed database of the catchment is developed for hydrological analysis and modelling. Terrain characteristics, land use and land cover, soil characteristics, crop characteristics and yield, hydro-meteorological data, stream flow and reservoir water level information were collected from various sources and assimilated in the database.

Objectives of the hydro-allocation modelling is to set up a catchment-scale model to simulate core hydrologic processes, develop different land use scenarios to assess the impact of land use changes on the stream flow, and carry out the optimum allocation of water among irrigation and drinking water uses as well as among various geographical areas within the irrigation sector. ArcView-SWAT (AVSWAT) and MIKE-BASIN models were selected for the current study. AVSWAT is a hydrologic simulation tool built within GIS environment that is used for modelling the catchment hydrologic processes as well as to study the impact of different land use scenarios on the stream flow.

From the studies carried out it was found that MIKE-BASIN cannot prioritize the water allocation within a single sector i.e., irrigation across different crops across different areas. Consequently, it could not be applied to obtain an optimum water allocation scenario in the Malaprabha catchment. In addition, the recent version of MIKE-BASIN lacks the Excel-based optimization tool which was present in the older version. Therefore, the irrigation module available in the MIKE-BASNI is used to simulate the crop yield response to water availability under different conditions across the catchment as described in the FAO-33 Irrigation and Drainage Manual. Given the model limitations, economic optimization is

discussed in an example which uses estimates of efficiency of water application by using the AVSWAT (stream flow, evapotranspiration in the catchment, transmission loss) and MIKE-BASIN (evapotranspiration in the command area and crop yield) simulation results. The example is used to discuss issues concerning the feasibility of water trades between the the reservoir catchment and the catchment downstream, specificallt the command area of the reservoir.

From the study, it has been found that extensive irrigation extraction in zone-2 and zone-3 has resulted in drastic reduction in the inflow to the Malaprabha reservoir, especially udirng the dry season. A comparison between the stream flow and the drinking water supply requirement, taking Bailhongal town in the lower catchment as a case study, shows that the stream flow in the past decade is less than the demand at the intake point during the peak summer (2-4 months) in dry years. Different land use scenarios have been developed and the corresponding simulation results shows that the current trend of irrigation intensification could lead to more months of water scarcity. An average 35% increase in the degree of water scarcity could result from 56% conversion to sugarcane from the current rainfed areas. Improvement scenarios, where the increase in stream flows can result from reduction in the irrigated areas (sugarcane) have also been studied. It has been found that a 10% change would halve the current duration of water scarcity. An average 50% reduction in the intensity of water scarcity can be achieved with 56% reduction in the sugarcane area.

Due to the evaporation and transmission losses along the channel, it is concluded that for the economic benefit from one cubic meter of water, crop yield in the command area may have to be up to several times that in the upper catchment, assuming cropping pattern, prices and farming costs are similar in the command area and in the upstream catchment. A calculated example shows that upstream-downstream water trading, if it were possible from an institutional and technical point of view, would not be economically feasible during June-October (due to surplus water supply) and March-May (due to water scarcity). From the analysis economic water trade is found feasible during the period November-February if yield at downstream is more than that at upstream.

1. Introduction

Malaprabha basin in Belgaum district, Karnataka, India is one of the deficit sub-basins in the Krishna River Basin. Total area of the Malaprabha basin till it joins the main Krishna river is 11549 sq.km. Malaprabha river originates from Sahyadri hill range (at an altitude of 792 m) at 16 km to the west of Jamboti village in Khanapur taluka. The Malaprabha reservoir was commissioned in 1974 and has a gross storage capacity of 1070 MCM and a live storage capacity of 830 MCM. The project also has eleven foreshore lift irrigation schemes with a total irrigation potential of more than 270 km^2 for those villages affected by the Malaprabha project. The irrigated area in the Malaprabha catchment has increased from 10% in 1970s to 30% of the total cultivable land in 2003 (Statistical Abstract, Government of Karnataka, 2004). The catchment area of the Malaparbha dam is 2204 sq.km (which is called the Malaprabha catchment hereafter) and is in the semi-arid climate zone. Location map of the Malaprabha catchment is shown in Fig. 1.

Fig. 1.1 Base map of the upper Malaprabha catchment

Due to increasing unsustainable land use practices the area is experiencing water scarcity, thereby making the inter-sectoral water allocation a challenging issue. Water availability in the lower catchment is closely related to the land use practices and water extraction in the upstream. In order to study the feasibility for Payment for Watershed Services (PWS) in the Malaprabha catchment, hydrological analysis of the catchment response to land-use was carried out. This includes study of the hydrological characteristics of the catchment and setting up the hydrological and water allocation model for the catchment area.

Hydrological analysis of the catchment includes the study of topography, soil characteristics, historic data related to rainfall and stream flow, its spatial and temporal variability, cropping pattern and agricultural practices in the area related to water resources. Hydrologic modelling

helps understand the current resource availability as well as the impact of agricultural practices on the overall water availability in the catchment. The allocation model is used to study the optimal allocation of the water resources among different geographical areas as well as different sectors.

1.1 Catchment characteristics

The area is characterized by the heterogeneity in topography, hydro-meteorology, soil and land use conditions. To simplify the heterogeneity of the catchment, it can be divided into three agro-hydrological zones as shown in Fig. 2.

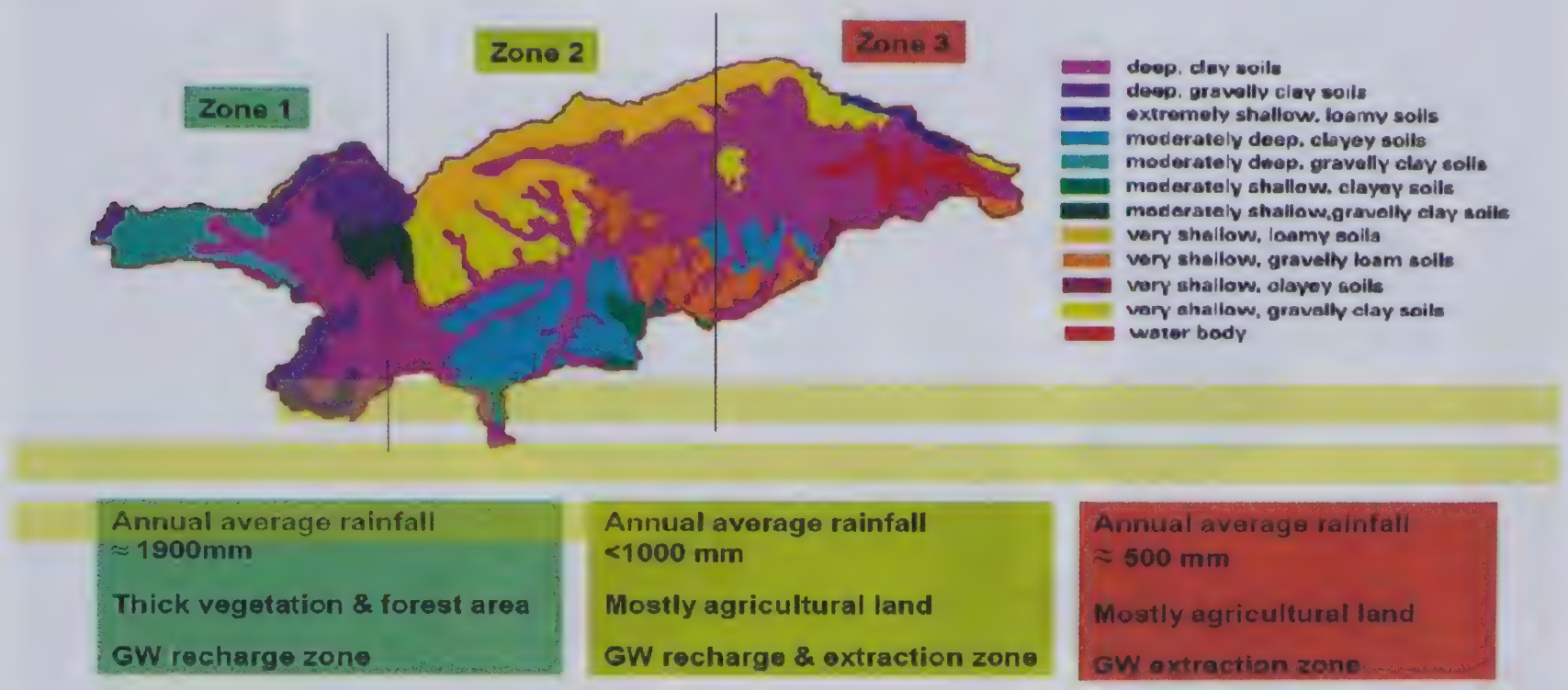
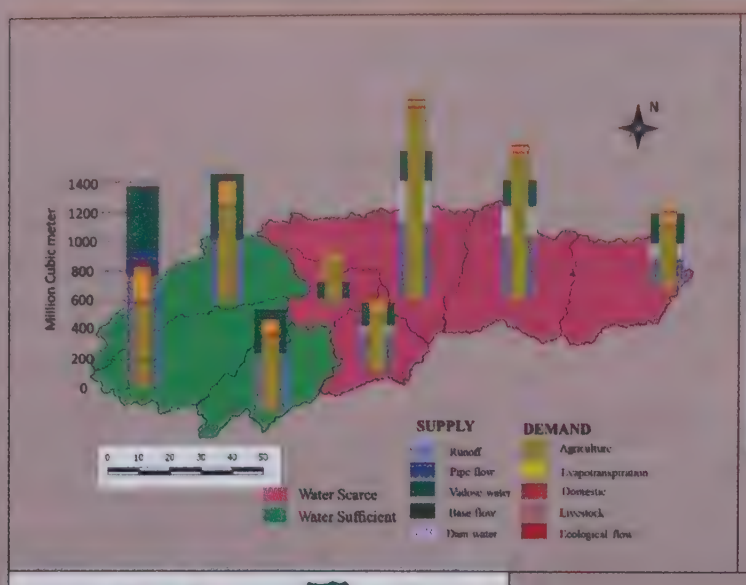


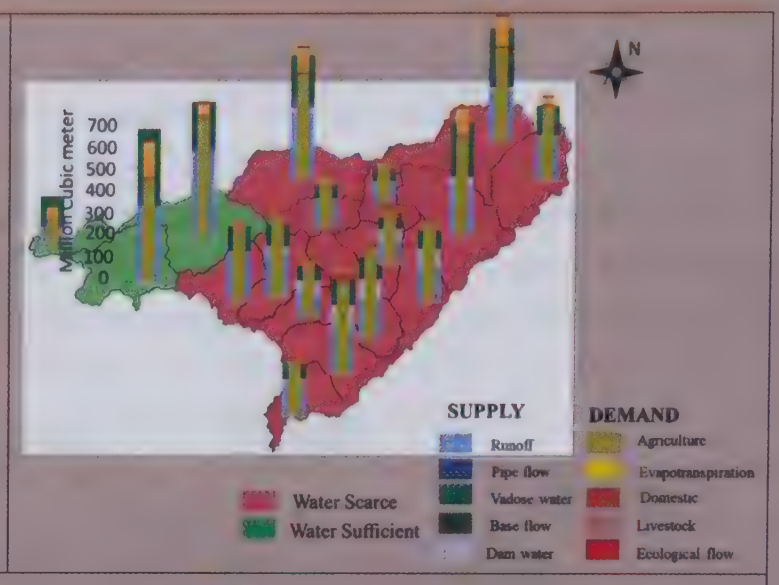
Fig.1.2 Hydrological zones in the upper Malaprabha catchment

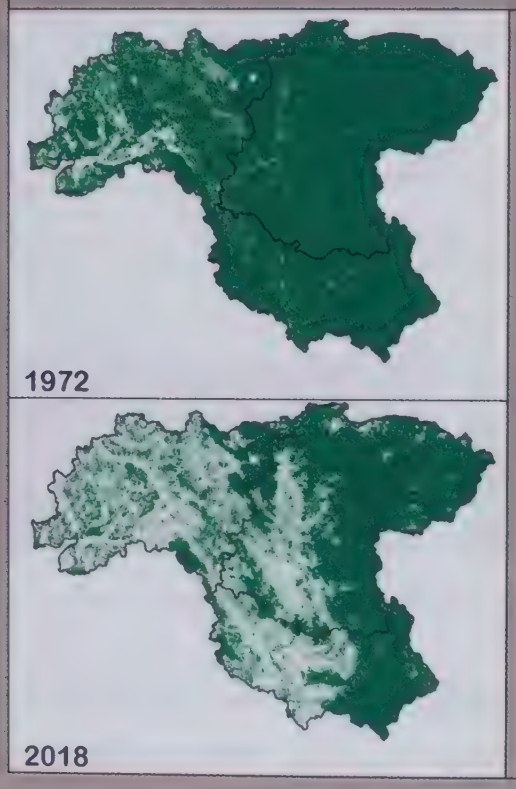
Zone-1 and parts of zone-2 are characterized by hilly terrain and gravely soil, cracking clay or loamy soil that assists percolation. Fairly dense forest covers almost 60% of the zone-1. Zones-2 and 3 are dominated by agricultural areas, which were initially under rainfed cultivation. However most of these areas are now converted into irrigated cultivation by extracting stream water or pumping the groundwater through private borewells. Annual average rainfall in the area varies from 2000mm in zone 1 to 500 mm in zone 3. Due to the variation in rainfall distribution, land use conditions and geological characteristics of the catchment, almost 80% of the stream flow and the ground water recharge from the catchment occurs from zone-1. On the other hand almost 60% of the post-monsoon runoff is resulted from zone-2. Much of the stream flow generated from zones 1 and 2, as well as the groundwater is extracted by zones 2 and 3, for irrigation. This results in reduced flow in the river especially during the dry season.

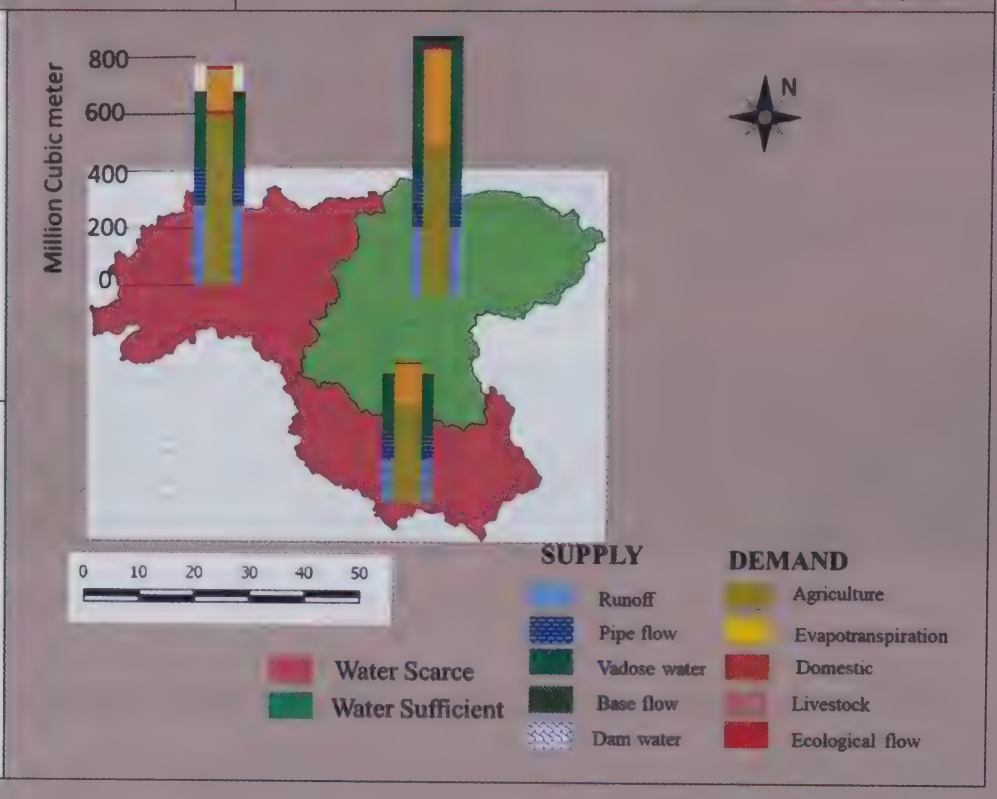
Eco-Hydrologic Footprint in Ghataprabha, Malaprabha, and Mahadayi Rivers with Landscape Dynamics

T V Ramachandra Sai Omkari P Vinay s









Sahyadri Conservation Series: 108,
ENVIS Technical Report: 178

August 2021

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Public Disclosure Authorized

Public Disclosure Authorized

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GOVERNMENT OF KARNATAKA

Karnataka Urban Water Supply Modernization Project (KUWSMP)

ENVIRONMENTAL AND SOCIAL ASSESSMENT (ESA) OF CONTINUOUS WATER SUPPLY PROJECT IN HUBBALLI-DHARWAD, KARNATAKA, INDIA

DRAFT FINAL REPORT
Oct 2021

KUIDFC

Karnataka Urban Infrastructure Development Finance Corporation (KUIDFC)

SL No	Description	2011	2021	2031	2041	2053	Remarks
c	Kanvihonapura village	0.87	0.87	0.87	0.87	0.87	@90lpcd+15% losses
	Total (Raw Demand)	177.79	209.86	242.94	278.97	326.08	Without losses
	Clear Water Demand	162.61	192.9	224.14	258.17	302.66	Including kundgol+14 villages

Source: Project Report, TCE, 2019; Enroute villages supplied raw water only and hence is not be considered in clear water requirement

2.3.6 Source studies

The population of the Hubballi-Dharwad cities and Kundgol town is expected to reach 13,54,085 by the year 2031 and 15,80,927 by the year 2041 as per population projections. The present treated water requirement for twin cities and Kundgol town is 188 MLD. This demand is expected to reach 224 MLD by the year 2031 and 258 MLD by the year 2041. The present supply capacity is about 142 Mld (74 MLD + 68 Mld) from surface source and about 8 Mld from ground water source. There is a need for augmentation of present water supply system to take care of immediate as well as future water demand of the city. Considering transmission and treatment plant losses of 5% the raw water requirement to meet the water demand by the year 2041 is 251 MLD (92 Mcum per year). In addition to city requirement, bulk raw water is also being supplied to the enroute 12 villages between Saundatti and Amminbhavi from existing Malaprabha Water Supply Scheme (MWSS). The enroute villages raw water requirement is 5.62 MLD. The total raw water requirement of City, nearby Industrial areas, Kundgol town and enroute villages is 279 MLD (102 M cum per year) by the year 2041.

The project proposes to utilize the entire quality of water from Renukasagar reservoir to meet future water requirements of the city. Availability of water in the reservoir was analysed and as presented in **Annexure V**, the water is available to meet the requirements of Hubballi-Dharwad.

2.4 The Proposed System

2.4.1 Intake and Raw Water Transmission Main

A New intake, coffer dam & other Aux works including intake pipeline is proposed at Saundatti. Also, a new raw water transmission line of 1219 mm diameter of 29.2 km MS from Saundatti to Amminbhavi WTP including Saddle supports for Back water crossing (550m) is proposed to cater to the additional and future raw water requirement.

2.4.2 Water Treatment Plant

The water treatment plant requirements are worked out based on the demand estimation. The existing treatment facility available has been reviewed and phase wise requirements of WTP have been worked out and the details are as Indicated in Table given below

d. MWL (Mtrs)	633.83
e. FRL (Mtrs)	633.83
f. MDDL (Mtrs)	623.93
g. Top level of Reservoir (Mtrs)	637.19
h. Irrigation sluice level (Mtrs)	619.35
i. River sluice level (Mtrs)	612.03
SPILLWAY	
a. Location	Central
b. Length (Mtrs)	85.34
c. Flood Lift (Mtrs)	12.19
d. Discharging capacity (Cumecs)	5236
e. Gates	4 (15.24m x 12.19m) radial gates
f. Crest level (Mtrs)	621.79

AREA-CAPACITY DETAILS OF RENUKASAGAR RESERVOIR

REDUCE LEVEL (m)	WATER SPREAD AREA (M Sq.m)	CAPACITY (Mcum)
609.60	1.17	1.66
611.12	2.53	4.48
612.65	5.22	10.39
614.17	**7.82**	20.33
615.70	11.45	35.01
617.22	13.58	54.08
618.74	20.45	81.43
620.27	24.95	115.97
621.79	31.33	158.75
623.32	38.87	212.14
624.84	47.16	277.61
626.36	64.17	362.20
627.89	75.03	468.18
629.41	86.34	591.04
630.94	98.65	732.13
631.24	102.56	762.80
631.55	106.57	794.67
631.85	110.59	827.77
632.16	112.28	861.73
632.46	119.13	905.36
632.76	121.53	933.68
633.07	123.94	971.09
633.37	126.33	1009.23
633.68	128.95	1048.14
633.98	131.41	1087.82

SUMMARY OF SIMULATION STUDIES

In the absence of sufficient data such as inflows of Neersagar reservoir, simulation studies could not be carried out to work out the availability and dependability of the source. However based on the

records of drawls from the reservoir for the water supply to Hubballi- Dharwad twin cities city for the past 10 years it is assessed that this source could yield 44 MLD (16 Mcum).
The requirement of 279 MLD (102 Mcum per year) has to be met by Renukasagar reservoir only. This quantity is just 8.7% of the average catchment yield. Supply for Drinking water gets top priority as per National water policy and if situation demands irrigation releases may be curtailed. Based on the catchment yield and the reservoir storage capacity of Renukasagar reservoir, this source is considered 100 % dependable for the supply of 279 MLD (102 Mcum per year) to Hubballi-Dharwad twin cities including enroute villages and Kundgol town and nearby industrial areas to meet water demand upto the year 2041.
Ground water source shall be treated as supplementary source in case of any emergency or till implementation of distribution system in the un served areas.

PROPOSED WATER SUPPLY SCHEME

The proposed water supply schemes would be from the following one Surface source.

Malaprabha Water Supply Scheme (MWSS)

The above scheme is planned to be integrated into the proposed system which minor rehabiltation and augmentation. Based on the source studies this source is proposed for augmentation to meet the future demands.
Also considering the fact that NWSS had become inoperational due to insufficient water in the reservoir on two occassions, MWSS is proposed to cater to the needs of the city in the event of failure of NWSS. The following are the component wise observations of this scheme.

Observations:

- The jackwell cum pump house at Saundatti is a new structure and is in a good condition and is capable of housing eight deep well turbine pumps. Hence it is planned to integrate this into the proposed system and no additional jackwell or pump house is required until 2041. However pumps will be added accordingly.
- However, an additional Intake well of diameter 9.5 mt is proposed to be built at 500 mt inside the reservoir from the existing jackwell location to draw the raw water during the dry season from dead storage also. It is proposed to connect with existing intake well with 2 nos. of 1600 mm with RCC NP3 class pipe.
- The details of mechanical and electrical parts rehabilitation is being dealt in the respective chapters.
- Two raw water transmission (pumping) lines (29.14 kms each) of 965 mm and 1168 mm diameters MS exists which were laid in 2004 and 2011 respectively. These lines are in a good condition and proposed to be retained and integrated into the proposed system.
- A new raw water transmission line of 1219 mm diameter MS from Saundatti to Amminbhavi WTP is proposed to cater to the additional raw water requirement. However, due to space constraint for vehicle movement on the access bridge to the Jackwell for initial streach of 60m, 1016mm dia pipe is proposed inlieu of 1219mm dia pipe.
- Saddle/Pier Support Bridge is proposed for a length of 550m to cross the back water for raw water pipeline.
- Two WTP's of 73.8 MLD and 68 MLD commissioned in 2004 and 2011 exist at Amminbhavi which are in a good condition and have been integrated into the proposed system.
- KUWS&DB has taken up construction of 40 Mld WTP under link investment.

Rev No-05

Date: 20/11/2023

ENVIRONMENT, SOCIAL, HEALTH AND SAFETY

MANAGEMENT STRATEGIES AND IMPLEMENTATION PLAN FOR

CONTINUOUS WATER SUPPLY SCHEME
HUBBALLI DHARWAD, KARNATAKA

KUIDFC
Working Towards Better Urban Living

KUIDFC
Working Towards Better Urban Living

L&T Construction
Water & Effluent Treatment

3.6.1 Malaprabha Water Supply Scheme (MWSS)

Malaprabha water supply scheme source is Renukasagar reservoir, located on the Malaprabha River near Saundatti. It is about 53 km from Hubballi and 42 km from Dharwad. Raw water is pumped from the jackwell to the WTP, Amminbhavi at 30 kms. Most of the infrastructure presently being used under MWSS has been constructed in mid-2000 and completed by 2010.

3.6.2 Neersagar Water Supply Scheme (NWSS)

The source of the Neersagar Water Supply Scheme is Neersagar Reservoir on Bedti Nala, located near Dhumwad Village. The Neersagar Reservoir is located towards the southwest of Hubballi - Dharwad at about 23 km from Hubballi and 17 km from Dharwad. This is the old scheme which has been in operation for more than 55 years.

The NWSS consists of a Neersagar reservoir, jack well / intake, raw water transmission (gravity) main, raw water pumping station at Dhumwad, raw water transmission (pumping) main, WTP at Kanvihonnapur, clear water transmission and distribution to Hubballi and Dharwad. The system is designed for 40.86 MLD (9 MGD) in 20 hrs. However, presently the scheme is being discarded due to the unreliability of the source.

3.6.3 Ground Water Source

Some areas of the city are supplied with groundwater sources from bore wells. 1596 bore wells out of 1814 are functioning. 1047 out of 1596 are fitted with power pumps of capacity varying between 1 HP and 12 HP. The approximate yield/supply from these bore wells fitted with power pumps is 8 MLD.

Water from bore wells is supplied either through a separate distribution system or filled into a public stand post for further collection. The bore wells are operated and maintained by KUWSDB. The bore wells act as a source of water in areas where there is no network coverage (with a surface source) or during non-supply days of surface water. Also, most of the industrial areas promoted by KIADB are supplied through bore wells due to a shortage of treated surface water.

As indicated by the Authorities, the quality of groundwater in Hubballi-Dharwad meets the permissible CPHEEO standards for potable water. As per Ground Water Resource Assessment-2020 issued by Central Ground Water Board vide Public Notice No. 16/2021, dated 12th October 2021, assessment unit "Hubbali & Dharwad" is categorized as Safe category.

3.7 Sociocultural profile : important customs, events, etc.

The district is a place for people belonging to various religions like Hinduism, Islam, Jainism, and Christianity. Hindus are spread across rural and urban areas. The widely spoken language in the district is Kannada. The district receives special recognition on the cultural map of the state. It has enriched the cultural fields like music, literature, and art by producing famous and memorable names. The prestigious Jnanapeeta awardee Dr. D. R. Bendre of Dharwad, has contributed to the field of literature, to the extent of infinity.

Renowned classical Hindustani singers like Kumar Gandaharva, Smt Gangubai Hangal, Mallikarjun Mansur, Pt. Bhimasen Joshi, Basavaraj Rajguru, and Sangeeta Katti have not only contributed to the field of music but have also made the district proud. The well-known artist Halbhavi also belongs to Dharwad.

3.8 Important industries and other economic activities undertaken in the city.

Hubballi-Dharwad, the second largest Municipal Corporation in Karnataka State, was established in year 1962. The twin cities Hubballi and Dharwad play a vital role in the development of the State by contributing majorly in educational, commercial, industrial and economic sectors. In the agrarian context, the twin cities Hubballi and Dharwad are rich in natural resources and provide a considerable harvest of commercial crops such as cotton, ground nut, jowar, oil seeds etc.

3.9 Current status of water supply in the city (before advent of this project)

The population of the Hubballi-Dharwad cities and Kundgol town is expected to reach 13,54,085 by the year 2031 and 15,80,927 by the year 2041 as per population projections. The present treated water requirement for the twin cities and Kundgol town is 188 MLD. This demand is expected to reach 224 MLD by the year 2031 and 258 MLD by the year 2041. The present supply capacity is about 142 Mld (74 MLD + 68 Mld) from the surface source and about 8 Mld from the groundwater source. There is a need for augmentation of the present water supply system to take care of the immediate as well as future water demand of the city. Considering transmission and treatment plant losses of 5% the raw water requirement to meet the water demand by the year 2041 is 251 MLD (92 Mcum per year). In addition to city requirements, bulk raw water is also being supplied to the en route 12 villages between Saundatti and Amminbhavi from the existing Malaprabha Water Supply Scheme (MWSS). The en route villages' raw water requirement is 5.62 MLD. The total raw water requirement of the City, nearby Industrial areas, Kundgol town, and en route villages is 279 MLD (102 M cum per year) by the year 2041.

The project proposes to utilize the entire quality of water from Renukasagar reservoir to meet future water requirements of the city.

Table No -4, No of households with water pipe connection (on 30/09/2022)

Sl. No	Zone	Total No. of Households (Properties) as per consumer survey	Total No. of piped connections (as per records)	% of house holds with piped water Supply
1	Hubli Demo Zone	9710	10186	105 %
2	Dharwad Demo Zone	7805	6936	89 %
3	Hubli P1P1 & P1P2	24674	21155	86 %
4	Dharwad P1P1 & P1P2	27705	22699	82 %
5	Hubli Intermittent Zone	132382	115437	87%
6	Dharwad Intermittent Zone			

Rapid Biodiversity Survey at Bandhura Nala Diversion Dam Site

Swati Kittur **K. S. Gopi Sundar** **Prashant Kamath**

Along with locals living beside the project area, we visited the project area using the existing roads and routes that villagers use for grazing cattle and other purposes. We also visited publicly accessible roads around the project area within a distance of 10 km to develop a rapid and admittedly, very restricted, understanding of the faunal biodiversity of the general area. A curated set of observations that we observed on 10-06-2025 are presented below with a focus on the species that we were able to photograph. All these observations constitute either the first time this species has been reliably observed in Belgaum district, or are part of a very small number of observations of the species in the district, or even the general area of this part of the northern western ghats. The general absence of systematic faunal surveys and other work in the area makes these observations important to understand the value of the surveyed forests for biodiversity at large. For taxonomy, we use the nomenclature as per the online website www.inaturalist.org which has a global community of taxonomists, scientists and naturalists providing the most updated taxonomic information. Several observations provided in this section have been uploaded on inaturalist.org to ensure transparency of identification of the varied taxa. For observations not added to inaturalist.org, we obtained identification information from specialists of the respective taxa. Not all observations could be identified to the species level attesting to the relatively low level of work that has been conducted on the local fauna and the need for high quality science to fully understand the value of the area to biodiversity. Additional information on the ecological requirements and conservation status of the taxa included in this section can be had in the references used to build the species profiles on Wikipedia.org and inaturalist.org. We use only readily available sources as references to ensure that required information is readily available.

The forest canopy and density of relatively old trees was dense and, along with the monsoonal conditions of heavy cloud cover and rain, provided a setting of lushness that is characteristic of tropical and sub-tropical rain forests.

The most outstanding observation of the brief 2-hour walk was the sightings of three different individuals of the Western Ghats Tiger Beetle Cicindela andrewesi. This species is endemic to the Western Ghats, and like most Tiger Beetle species in the country, is extremely poorly studied. We observed these both in the leaf litter on the forest floor, and displaying on

trails beside forests. This beetle species has been recorded from a very small number of locations on the international citizen-science portal inaturalist.com suggesting that the species either occurs in low numbers naturally, or has behaviours that disallow their ready observation. Tiger Beetles are sought after taxa by both naturalists and professional entomologists alike, and the very low reporting of this species on well used online portals is an indication of the importance of the site we visited for this beetle species.

Another Tiger Beetle of significance that we observed was the Black-headed Tiger Beetle Cicindela fabriciana, another species that is known only from a handful of observations, with almost nothing known of its ecology. It is known to be endemic to few locations of the Western Ghats.

Tiger Beetles are used the world over as a taxa as indicator species, and the observation of two species in such a short visit suggests that the project area is of high significance to endemic forest taxa.

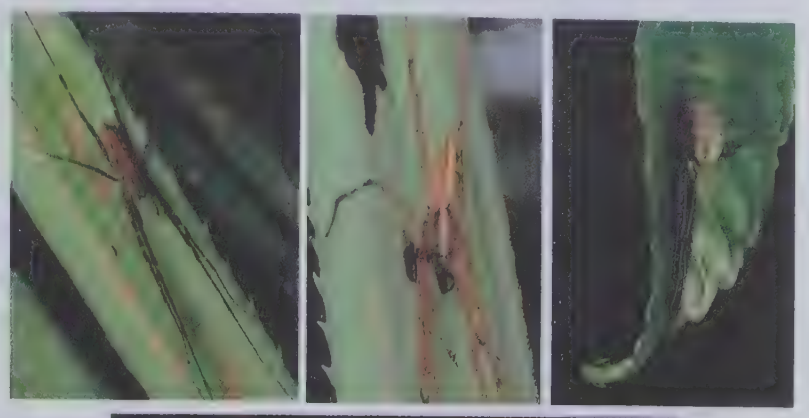
Several faunal species were observed that highlight the immense value of the riparian ecosystem of the

project area to specialist faunal taxa. We provide examples that, put together, indicate the presence of a very diverse set of wet habitats in the proposed project area. Our observations of some of these, in no particular order, are provided below.

We observed several individuals of the damselfly species, the White Dartlet Agriocnemis pieris at and beside the streams and rivers in the proposed project area. This species, like all Odonata (dragonflies and damselflies) are specialists of areas with abundant water and require marshes and wet grassland vegetation to breed. The species is largely restricted to the Western Ghats region, with few records from Nepal, and is thought to also potentially be occurring in wet habitats of Bangladesh. That this species was observed even in overcast conditions suggests that the area is very important habitat for them, and is suggestive of a good population occurring in the area.

On a log in one of the streams, we observed the relatively large Fishing Spider Dolomedes sp. Members of this genera are aquatic specialists being covered in short, velvety hair that are hydrophobic allowing these spiders to run on the water surface or dive in water to catch prey that includes aquatic insects and fish.

A large number of Nursery-web Spiders (Hygropoda sp.), Long-jawed Orb-weaver Spiders (Tylorida sp., and Tetragnatha sp.) and were observed on the vegetation beside and in the streams and rivers. The presence of so many of these taxa, all of which are specialized to live in aquatic systems, suggests relatively undisturbed conditions while also suggesting a healthy availability of prey for these predators, in turn indicating a healthy system of forests with aquatic habitats. For representative purposes, four photographs (two of Hygropoda sp. (left most) and one each of Tylorida sp. and Tetragnatha sp.) are provided below.



Several species of Wolf Spiders (family Lycosidae) were observed on vegetation and on the forest floor, with a large number of these being female carrying egg cases. Lycosidae are well known to show parental care in the early stages of young, and the presence of so many species, and so many individuals of these spiders is indicative of a healthy system that is able to provide a large number of prey to so many of these predators. Two unidentified species with egg sacs are shown here. Wolf Spiders are widely regarded as a taxa that provide immense ecosystem services by predating on a wide variety of insects that may be pests on crops, and many attempts are ongoing worldwide to see if this taxa of spiders can be used to control major insect pests in cropfields.

A large number of adult and juvenile frogs were observed in the streams, the rivers and in the forest litter. This suggests that the area is an important breeding area for these amphibians, most of which are endemic to the Western Ghats. A collage is provided below of some of the species that were identifiable at least to the genus level.

(a) A sub-adult of the Bicoloured Frog Clinotarsus curtipes.

(b) An adult of a species of Skipper Frog Euphlyctis sp.

(c) A juvenile of the ranid genera Indosylvirana.

(d) An adult of the Burrowing Frog of the genus Sphaerotheca.

(e) An adult of an unidentified frog.

The frog species, along with many other Bush Frogs and litter-dwelling frogs that we heard and observed, suggest that the area is a biodiversity hotspot serving as breeding habitats of one of the most sensitive aquatic taxa of the world. Frogs are among the fastest declining taxa globally largely due to habitat disturbance and removal, and any development work that changes hydrology will have deleterious impacts on a large number of species, many of which are of great significance due to being endemic to the Western Ghats.

A number of other invertebrate taxa were observed which collectively suggested that the forests harbour a high diversity of faunal life. A collage of these taxa is provided to help showcase the immense biodiversity of the proposed project area.

(a) Mating pair of Platycorinus peregrinus leaf beetles.

(b) An unidentified forest Cicada.

(c) An Asian Orb-weaver Spider (Macracantha sp.).

(d) The Assassin Bug Panthous bimaculatus.

(e) An unidentified fly species.

(f) An unidentified forest cricket species.

(g) A forest grasshopper of the genus Ceracris.

Collectively, the very brief and rapid survey of only a very small part of the area where the project is proposed showcases that the area provides a multitude of wild habitats that is assisting in maintaining significant biodiversity. A more detailed and systematic study will likely help discover the full extent of biodiversity resident in the area, and is needed prior to any development project instituted in the area. The biodiversity we recorded show that the region is exceedingly diverse, like most of the locations within the Western Ghats, but also that the area is home to many species that are endemic and therefore of global conservation value. The range of species we recorded even in such a short one-time survey indicates that the area currently supports species that require a range of macro and micro habitats, and also showcases many specialist species that require forest wetlands, forest vegetation, and forest litter.

In the brief report, we do not include any information on major vertebrates (mammals and birds) since we visited on a very rainy day which provides conditions unsuitable to list these taxa. Given the large number of endemic species of invertebrates and amphibians we recorded even in this very brief survey, the number and species of higher vertebrates habiting the area is likely to of great conservation value.

Sharing Innovative Experiences

VOLUME 3

Examples of Successful Economic, Environmental and Sustainable Livelihood Initiatives in the South

Published by:

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Special Unit for Technical Cooperation among Developing Countries

TWN
Third World Network

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The United Nations Development Programme (UNDP) is the UN's largest source of grants for development cooperation. Its funding is from voluntary contributions of Member States of the United Nations and affiliated agencies. A network of 132 country offices — and programmes in more than 170 countries and territories — helps people to help themselves.

Technical Cooperation among Developing Countries (TCDC) is a means of building communication and of promoting wider and more effective cooperation among developing countries. It is a vital force for initiating, designing, organizing and promoting cooperation among developing countries so that they can create, acquire, adapt, transfer and pool knowledge and experience for their mutual benefit and for achieving national and collective self-reliance.

Third World Network (TWN) is a network of groups and individuals involved in bringing about a greater articulation of the needs, aspirations and rights of people in the Third World; a fair distribution of world resources and forms of development which are humane, are in harmony with nature and fulfil people's needs.

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Preface

Despite the well-reported prevalence of social, economic and environmental problems and, in some cases, crises in countries of the South, there also exist many useful and valuable policies, practices and experiences in developing countries that have contributed to the well-being of their people.

Although these positive experiences may have evolved from the specific social and cultural conditions of these countries, they can also often provide valuable insights as well as lessons that people in other countries can learn from.

In some cases, the practice or policy of one country can be usefully replicated in other countries, of course with some modifications to suit the specific circumstances of the countries concerned.

It is, however, often difficult for policy makers or institutions from one country to obtain information about such positive experiences in other countries.

The United Nations Development Programme is convinced that the sharing of experiences among developing countries has a critical role to play in the search for, and application of, appropriate development policies and practices.

With this in mind, the Special Unit for Technical Cooperation among Developing Countries of the UNDP initiated a research project on "Good practices and innovative experiences in the environment, social and economic sectors in the South." The project was implemented by the Third World Network, whose international secretariat is based in Malaysia.

The aim of this project was to identify, collect information and describe practices and experiences by institutions and persons in developing countries that have been successful in solving environment, social and development problems.

The project covered practices and experiences in the governmental sector as well as in private and social institutions, non-governmental organisations, and local communities.

7.

Water-efficient sugarcane farming

1. GENERAL INFORMATION

1.1 Title of practice or experience

Water-efficient sugarcane farming

1.2 Category of practice/experience and brief description

A series of extremely intelligent modifications to the conventional package of practices associated with sugarcane farming developed by Suresh Desai, a sugarcane farmer in the Belgaum district of Karnataka state, South India, has enormous implications for the raising of sugarcane on farms in tropical countries.

The modifications drastically reduce the requirement of water in irrigated sugarcane plantations by approximately 75% and are basically in the nature of good practices as they encourage the use of existing resources in more efficient ways. In fact, because of their proven efficiency, the practices actually reduce the need for scarce resources. Yet they are able to achieve this economy without compromising on yields.

Traditionally, sugarcane has always been considered a water-guzzling crop. Where there is no water, sugarcane cannot be planted. Very often, lack of reliable water supply can lead to destruction of the entire standing crop or generate heavy crop losses.

The intensive demand for water, in turn, generates pressures for expensive irrigation systems, including canals. Such demands can be troubling, particularly in areas where resources are already scarce and administrators are keen to allocate them to more critical areas.

The modified package of practices described here does not require such costly investments, in the form of either large-scale development projects or capital or equipment. It also provides a unique example of sustainable agriculture as it succeeds in maintaining overall productivity without compromising the ecological basis of agriculture. In actual fact, it enhances soil quality, in contrast to other conventional methods.

1.3 Name of person or institution responsible for the practice or experience

Suresh Desai

1.4 Name and position of key or relevant persons or officials involved

As in 1.3 above

1.5 Details of institution

(a) Address: Organic Farmers Club, Bedkihal, Taluka Chikodi, District Belgaum 591 214, India
(b) Telephone: ++ (91) (8338) 66056

1.6 Name of person and/or institution conducting the research

Claude Alvares, Editor, Other India Press

1.7 Details of research person/institution

(a) Address: Above Mapusa Clinic, Mapusa 403 507, Goa, India
(b) Telephone: ++ (91) (832) 263 306, 256 479
(c) Fax: ++ (91) (832) 263 305
(d) E-Mail: oibs@bom2.vsnl.net.in

2. THE PROBLEM OR SITUATION BEING ADDRESSED BY THE PRACTICE/INNOVATIVE EXPERIENCE

Sugarcane is one of the most significant commercial/cash crops grown by farmers in countries of the South. Farmers plant sugarcane because it receives strong state support; sugarcane factories located in sugarcane-growing areas take up the sugarcane for crushing as soon as it is harvested; and development agencies allocate water resources and electricity connections on a priority basis for those areas growing the crop.

Sugarcane cropping is generally admitted to be resource-intensive. Only those farmers who have ready access to cash or credit, irrigation and water supply, fertilizers and pesticides can farm sugarcane. The sugarcane plant requires steady irrigation for its growing period of 18 months to 2 years, so

subsistence farmers are unable to farm sugarcane since sole reliance on monsoon supplies is inadequate. Payment for sugarcane also comes in lumps, but only after the harvest has been crushed at a sugarmill. Therefore, only those who can survive on such a system of deferred payments plant this crop.

The heavy requirement of water for sugarcane growing is one of the major question marks hanging over any extension of areas to sugarcane development. The allocation of such vast quantities of a precious resource to what is actually a privileged crop has had serious negative consequences for agriculture as a whole. The example of even well-endowed states like Maharashtra in western India is instructive.

Sugarcane in Maharashtra state is the major cash crop, but it is actually grown in drought-prone areas. This has meant the development of expensive artificial irrigation projects. 60% of the water from these projects is now used to irrigate 500,000 hectares of sugarcane-growing land (which amounts to 3% of the cropped area in the state). This means that other crops and non-sugarcane farmers can hope to get little or no water at all.

Traditionally, sugarcane is assumed to be a water-guzzling crop: farmers and agricultural scientists have in fact always assumed that the sugarcane crop requires a considerable amount of water to flourish. Therefore, the present or conventional package of practices recommends providing sugarcane fields 100% coverage in terms of water as essential. Farmers are advised to create extensive channels in their fields through which the water can be supplied directly to the roots of plants, flooding them in fact.

Since water of this quality and quantity is not going to be available in most places naturally, sugarcane growing requires infrastructure, particularly the erection of resource-demanding large dams, canals and lift irrigation schemes. The resource demands for such large schemes can be troubling, particularly in countries and areas where funds are already scarce and required for more critical areas.

Besides its heavy demand for irrigated water supplies, intensive sugarcane farming is ecologically destructive in several documented ways. Artificial irrigation often leads to waterlogging and salinity. The continuous, intensive growing of sugarcane in the same plot will generate symptoms associated with soil mining and soil sickness. This is because of the heavy use of synthetic fertilisers and pesticides.

The use of chemicals leads to a progressive decline in soil fertility since the soil fauna (including earthworms) and microbes are gradually eliminated. The more fertilisers are used, the more water is required.

Because of these unhealthy growing conditions, the sugarcane is prone to disease and therefore requires the use of more and more pesticides and fungicides.

Conventional practices recommended to ensure that any pathogens from the standing crop do not contaminate the following crop include completely burning the sugarcane waste in the field, which causes serious air pollution.

The practice is unsound because it leads to the unnecessary elimination and waste of significant quantities of organic materials which tropical soils are already deficient in. The other measure followed to dissuade pathogens is maintaining a regular period of fallow between crops every two years. None of these agricultural routines can be said to be a good practice.

In Suresh Desai's scheme of sugarcane planting, most of these practices have been eliminated precisely because they are ecologically harmful, unsustainable in the long term and require a lot of resources. Desai uses very little water compared to farmers elsewhere, yet he is able to maintain yields every year. In addition, he rejects the use of synthetic fertilisers and pesticides altogether.

What Desai has in fact perfected is an organic method of growing sugarcane in which he uses tried and tested farming techniques to replicate a natural growing environment in which sugarcane plants thrive. His innovations will therefore be of enormous interest to farmers everywhere, and all the more so because his methods do not require hefty cash balances or the importation of expensive machinery or non-farm inputs. This good practice is invariably cost-effective and is attractive for precisely that reason.

3. DESCRIPTION OF THE PRACTICE/INNOVATIVE EXPERIENCE AND ITS MAIN FEATURES

Suresh Desai has evolved his organic farming system for growing sugarcane on a trial-and-error basis over the last six years.

As a conventional farmer, he originally relied on synthetic fertilisers for raising his crops on the six acres of irrigated land he and his brother (Ramesh) worked on. However, after several years of experience, he decided to discontinue the use of chemical fertilisers and pesticides because he was personally convinced that these damaged the environment and affected public health.

Desai is also acutely aware that water supplies are dwindling, not increasing. Therefore, out of self-interest, he decided to reduce dependence on water for his sugarcane crops. His objective was to investigate whether he could get his fields to produce a steady yield on a sustainable basis for as many years as possible. His first urgent aim, therefore, was to reduce the amount of water required by the plant. Sugarcane growing in his area was based on the practice of 100% irrigation. This means, in other words, that the entire field area in which the sugarcane is growing is irrigated. Sugarcane fields are therefore arranged in rows of water channels.

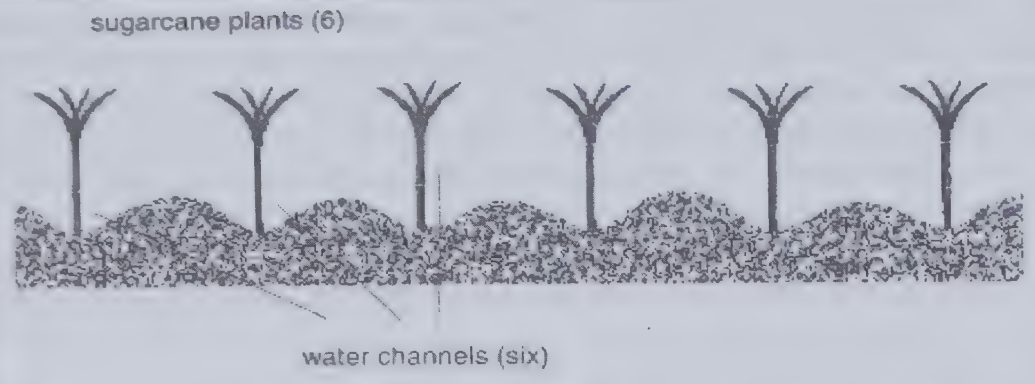


Diagram 1: Conventional sugarcane field with plants located in water channels.

After close observation, Desai came to the conclusion that farmers and agricultural scientists were making a big mistake in flooding the soil with irrigation water when all that the plant really required was soil moisture (and not soil wetness). He decided that the conventional practice of flooding the root zones of the crop actually damaged soil aeration, reduced soil fertility, and consequently made the plants susceptible to disease. It was also entirely unnecessary. In order to eliminate the resulting diseases that were in a sense inevitable, farmers were taught to burn the crop residues after harvesting the cane.

Desai began by first putting an end to the use of synthetic fertilisers. He switched to oilcakes instead (as a transitional measure; today, he does not use any external inputs). One of the principal reasons for suspending the use of synthetic chemicals was their devastating impact on earthworm populations.

Next, he redesigned the irrigation channels in his farmlands and began by reducing their number by half. This he did by eliminating every alternate channel. Thus, for every channel that he kept, one was eliminated. The channel that was eliminated was earthed up and turned into a bed of mulch in order to facilitate the retention of moisture in the soil. As he increased the quantum of organic matter in the mulch bed, he discovered the field as a whole was now able to retain far greater moisture than before and supply the growing sugarcane with moisture as required.

As Diagram 2 shows, the topography of his sugarcane fields was altered and this reduced water supply to the field area by 50%. Desai found that by doing this, the number of irrigations required also decreased. He was then required to irrigate his sugarcane only 9 to 10 times for the entire duration of the crop. This was because the soil was by now so rich in organic matter, the top stratum had been transformed into what he calls a 'bio-film' – a rich,

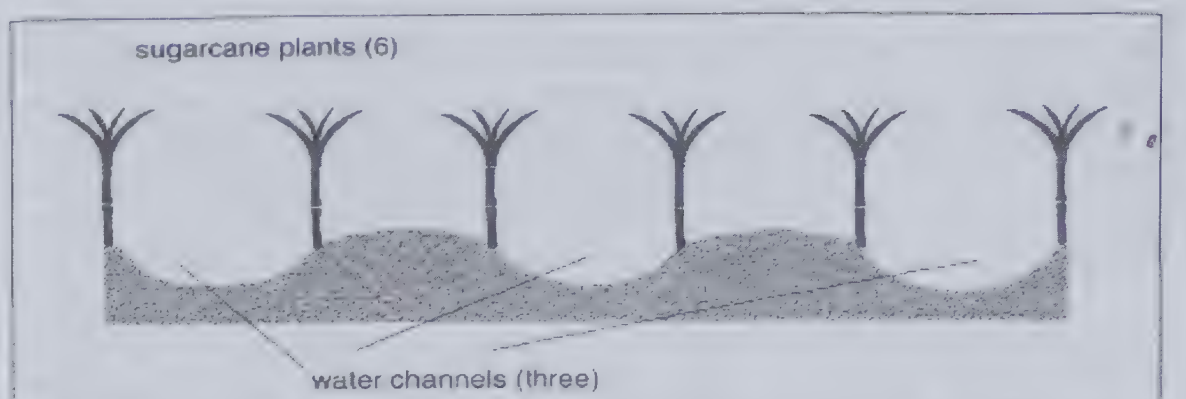


Diagram 2: Desai's sugarcane field with plants located on both edges of a water channel. In place of six channels, there are now only three.

loamy layer of soil that is not only densely populated by earth fauna like earthworms, but one that has also been taken over by entire colonies of beneficial fungi aiding the decomposition process by enhancing the breakdown rate of the organic matter placed in the field. Due to this composition, the soil not only retains the moisture it receives through the channels, but actually circulates it even to those areas that are not directly touched by water channels.

Three months later, Desai further modified his water-channel system to eliminate one more set of water channels. In other words, he reduced the number of water channels further by another half. He was able to do this simply because the water-retention capacity of his soils had further increased due to the measures adopted earlier. Now where other farmers maintain four water channels for four rows of sugarcane plants, he has succeeded in being able to raise four rows of plants with only one channel of water.

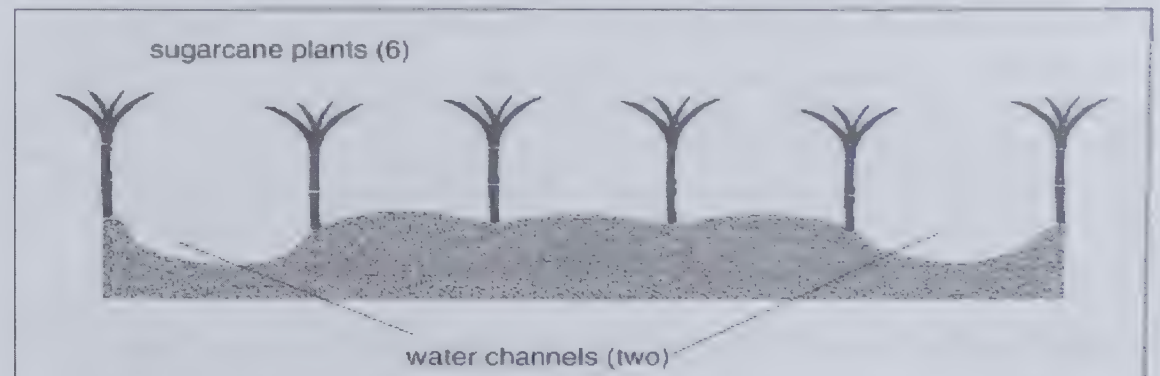


Diagram 3: Second stage: out of every five channels, now only two remain, but six rows of sugarcane plants continue to get moisture.

Desai cautions that one cannot immediately reduce water consumption by 75% but that the farmers must proceed in stages. The first step is to reduce the existing water channels by half, and this is an essential first step.

Thereafter, after three months or so, one can further reduce the channels by another half. The stages are necessary simply because the habit of water movement through the channels must first be stabilised during the first stage before the next stage is attempted. Failure to follow this principle would lead to unsatisfactory results.

Farmers realised that the new system of irrigation that Desai developed did not damage the root zone of the plants nor did it harm the structure of the soil. As the population of earthworms increased, moisture percolation and aeration improved.

Desai has also been experimenting with different substances that will support and enhance the nutrients available to the growing plants in the soil. For example, he introduces a mixture of jaggery, yeast and cowdung into the water channels to enhance microbial activity. He also grows plants which he calls 'aurogreens' that have symbiotic effects on the sugarcane, like horsegram. When the leaves of the horsegram fall into the water channels, they decompose to provide urea. Desai also grows turdhal (a lentil) partly for consumption and partly for mulching purposes. He says small additions of these kinds of plants are adequate for plant nutrition provided the soil has been strengthened by appropriate measures like the addition of organics and the creation of microclimates supportive of the growth of earthworms and beneficial fungi.

Since the plants are growing in an ideal environment and do not have to cope with the difficult problem created by too much water at their root zones (as in the other 100%-irrigated farms), Desai has found he does not have to rely on chemical pesticides for dealing with any pest or fungi attacks. Healthy plants are not susceptible to pest attacks. For this reason, he does not have to keep his fields fallow and burn the residue every three years as is customary but can maintain the growing of sugarcane continuously in his fields.

Burning of organic matter is a completely destructive practice as soils in tropical areas are generally bereft of or deficient in organic matter and burning reduces the stock of such organic matter even further. No sensible agricultural scientist would advise burning of any organic material in the fields for this reason. However, since agricultural scientists today are largely unofficial agents for the manufacturers of synthetic fertilisers and have grown used to the idea that crops can be raised solely with such fertilisers, they have maintained a rather callous attitude towards the importance of the humus content of the soil. Many of them feel there is no need whatsoever to have any humus or organic-matter content in the soil.

Desai's system has other advantages compared to conventional sugarcane farms.

Heavily-endowed sugarcane farms today produce an average of 60 tonnes per acre. However, as we have noted already, there are several problems with the system of practices that results in such yields and it is not quite clear whether the farmers profit more from an average yield of 60 tonnes using large quantities of water, chemicals and pesticides than from an average yield of 40 tonnes with a 75% water reduction and without the use of chemicals and pesticides.

Conventional practices recommends that a ratoon crop be taken after the harvesting of the first crop. Fields producing an average of 60 tonnes must have recourse to keeping the land fallow every three years, after the removal of two harvests.

In conventional sugarcane farming, a sugarcane crop takes approximately 18 months; thereafter, a ratoon crop is also taken. After the harvest of the ratoon, the entire crop residue is to be burnt on the field and the land kept fallow till the next planting, which may take anything from six months to a year. Thus, fields must be given a rest, so to speak, and during this period cannot be used for growing further crops.

Thereafter, considerable use of labour is required to plant the field afresh with fresh planting material. The cost of replanting a sugarcane field with new clips comes up to anything between Rs.4,000 - Rs.6,000.

In Desai's package of practices, the soil buildup is so dramatic, he is able to continue ratooning his crop everytime it matures without any attendant loss of output. He has already by now subjected his sugarcane fields to six ratoons and claims he will eventually reach twelve.

As Desai does not have to keep any of his fields fallow and his yield is a steady 40 tonnes per acre, he eventually harvests as much sugarcane over a three-year period as the farmer who raises 60 tonnes (also over the same three-year period).

The quality of Desai's sugarcane is also better. As it is purely organic, the sugar recovery is higher at 120 kg per tonne compared to conventional farms where sugar recovery remains around 100 kg per tonne.

Furthermore, in his case, as there is no fresh planting every three years, a lot can be saved on labour costs. In general, Desai has found that labour costs on his farm have been reduced by approximately 30% due to this and other factors.

In other words, seasonal sugarcane in his field has been converted into perennial sugarcane. During this period, the soil is continuously enriched as the farmer is able to concentrate most of his time and energy solely on im-

proving the organic content of the soil. The standing crop remains in a steady state economy, providing a sustainable yield of 40 tonnes per acre every year – the ideal of sustainable farming practices.

4. DESCRIPTION OF THE INSTITUTION RESPONSIBLE AND ITS ORGANISATIONAL ASPECTS

Suresh Desai is basically an institution in himself. Like all pioneers, he has worked on his own without much assistance from government officials or universities to perfect this system of organic farming of sugarcane.

Thereafter, he has sought to disseminate the modifications he has evolved to other farmers through the Organic Farmers Club. Today, the club has over 300 members who eagerly participate in discussions on his methods and further refinements of them where necessary. Desai says that approximately 1,500 acres of land in his area have already been converted to his system of water use to grow sugarcane.

The Organic Farmers Club is an informal institution and it is devoted to spreading the practice of organic agriculture among farmers in the area. Suresh Desai himself is one of the key individuals in the organic farming movement in the country initiated by ARISE, the federation of organic farming groups in India. He lectures frequently at organic farming workshops and schools on his method of water-efficient, organic sugarcane farming and has many followers.

5. PROBLEMS OR OBSTACLES ENCOUNTERED AND HOW THEY WERE OVERCOME

The greatest obstacle faced by Suresh Desai is the hold on farmers of the present package of practices which are based on intensive use of water in sugarcane farming. He says this association of sugarcane with water has become entrenched in the farmers' heads and only repeated demonstrations in farmers' fields that sugarcane can be raised without large quantities of water will eventually dislodge this completely erroneous idea from their heads.

6. EFFECTS OF THE PRACTICE/INNOVATIVE EXPERIENCE

The immediate effect of this practice is a dramatic reduction in the use of irrigation water (already a scarce commodity) of more than 75%. Conventional farmers irrigate their sugarcane fields 100%. Desai reduced the water requirement to 50% first and, by further innovations, brought it down another 25% through the neat redesigning of channels. This is not only bound to reduce costs to farmers, but the water saved can be allocated to farmers who have none or too little and for that reason are unable to do anything with their lands.

By the same measure of eliminating 50% of the water channels, Desai has created mulching beds for generating mulch and eventually humus. The result has been a major increase in soil quality and soil structure, and the creation of fresh living and operating space for earthworms and other species that help degrade organic matter. The consequence of that, in turn, has generated a situation in which the farmer is ready to question the necessity of adding any external inputs to the soil since he perceives his soil to be already rich and can be used for maintaining good crop production on a sustainable basis for several years.

By rejecting the use of chemicals and pesticides on his farm, Suresh Desai has shown that nature has adequate powers of regeneration and can raise plants on its own energy without the necessity of expensive (and environmentally damaging) inputs. An additional impact is that the air pollution from burning of the sugarcane crop residues in the field has been eliminated in this area and the ruinous practice of burning organic waste is eliminated.

7. SUITABILITY AND POSSIBILITY FOR UPSCALING

The modifications to the package of practices suggested by Suresh Desai are independent of scale and can be tried on small and large farms without any difficulty and with great benefit to all. The modifications, however, will work better on small farms as small farms, as a rule, are more efficiently managed than large farms. The construction of water channels is an art and can only be done effectively by hand.

In Israel, water is efficiently delivered to the root zone of plants through drip and sprinkler methods. These are expensive right from the inception, and require heavy advance capital availability, even though their efficiency is not doubted.

The Suresh Desai technique of reducing water channels and the raising of a 'bio-film' over the planted area is a cheaper, equally effective measure that can substitute for drip and sprinkler systems. The principal idea behind different methods to increase efficiency in water use is ultimately to provide adequate moisture at the roots. This can be done by repeatedly sending water through drip to the plant in small quantities. Or it can be sent through the alternative route proposed by Suresh Desai – enhancing the water-retention properties of the soil by several degrees.

The second alternative is achieved not only by increasing the organic content of the soil, but also by preventing water losses through evaporation by

simply covering the soil with organic material. Because of the known properties of rich organic soils, Desai's method is successful in spreading moisture through the soil, even to the root zones of plants two to three feet away.

8. SIGNIFICANCE FOR (AND IMPACT ON) POLICY-MAKING

The propagation of this method of organic farming for the raising of sugarcane, if made part of government policy, would help in better allocation of scarce resources and investments. It would help improve the productivity of sugarcane farms over the years as it would remove the element of uncertainty that presently dogs sugarcane production, largely due to the unpredictability of water supply itself as a result of the reliance of large water projects on good monsoon precipitation.

As the methods tried out and tested would improve sugarcane production in several farms, the total output of sugarcane in particular areas would not fall because overall efficiency would be improved. Most important, sugarcane would continue to be produced on a sustainable basis and resources assigned now to expensive, capital-intensive irrigation projects could instead be assigned elsewhere. Water from already constructed reservoirs could be assigned to farmers who do not get any of it, leading to enhanced employment opportunities.

9. POSSIBILITY AND SCOPE OF TRANSFERRING TO OTHER COMMUNITIES OR COUNTRIES

Suresh Desai decided to work out an alternative system that other farmers could also easily apply in their own fields. He has succeeded in evolving a new system which is basically a modification of the conventional system and which is easy to understand and replicate. There is therefore great scope for transfer of the method through direct learning and observation at Suresh Desai's farm. Desai himself has already organised several courses for interested farmers on his plot.

A simple manual which would describe the system of reduced channels would suffice to spread the technique among agricultural departments, extension centres and farming communities.

Suresh Desai's Publications Supporting the Report

MWDT Award 2011 Notings : Diversion for Drinking Water Claims

The Mahadayi Water Disputes Tribunal in its report has established that the water being diverted by KNNL is for irrigation purpose only. Hence claim of the Government of Karnataka is actually a disguise to divert the water for Irrigation only. Extracted page nos. 2346, 2347, 2363, 2364 as appended.

the purpose is to augment waters of Malaprabha reservoir to supply water fully to the notified area for Kharif and Rabi etc. The Tribunal notices that in the General Report at pages 1 to 10 of the DPR of 2010 of Kalasa Nala (Volume 19), there is no mention at all, about the diversion of 7.56 tmc of water for drinking purposes.

1098. From the above, it is apparent that the purpose of the two projects continued to be to augment the water of

Malaprabha reservoir to supply water fully to the notified area for Kahrif and Rabi etc. i.e., the purpose was simply to provide water for irrigation.

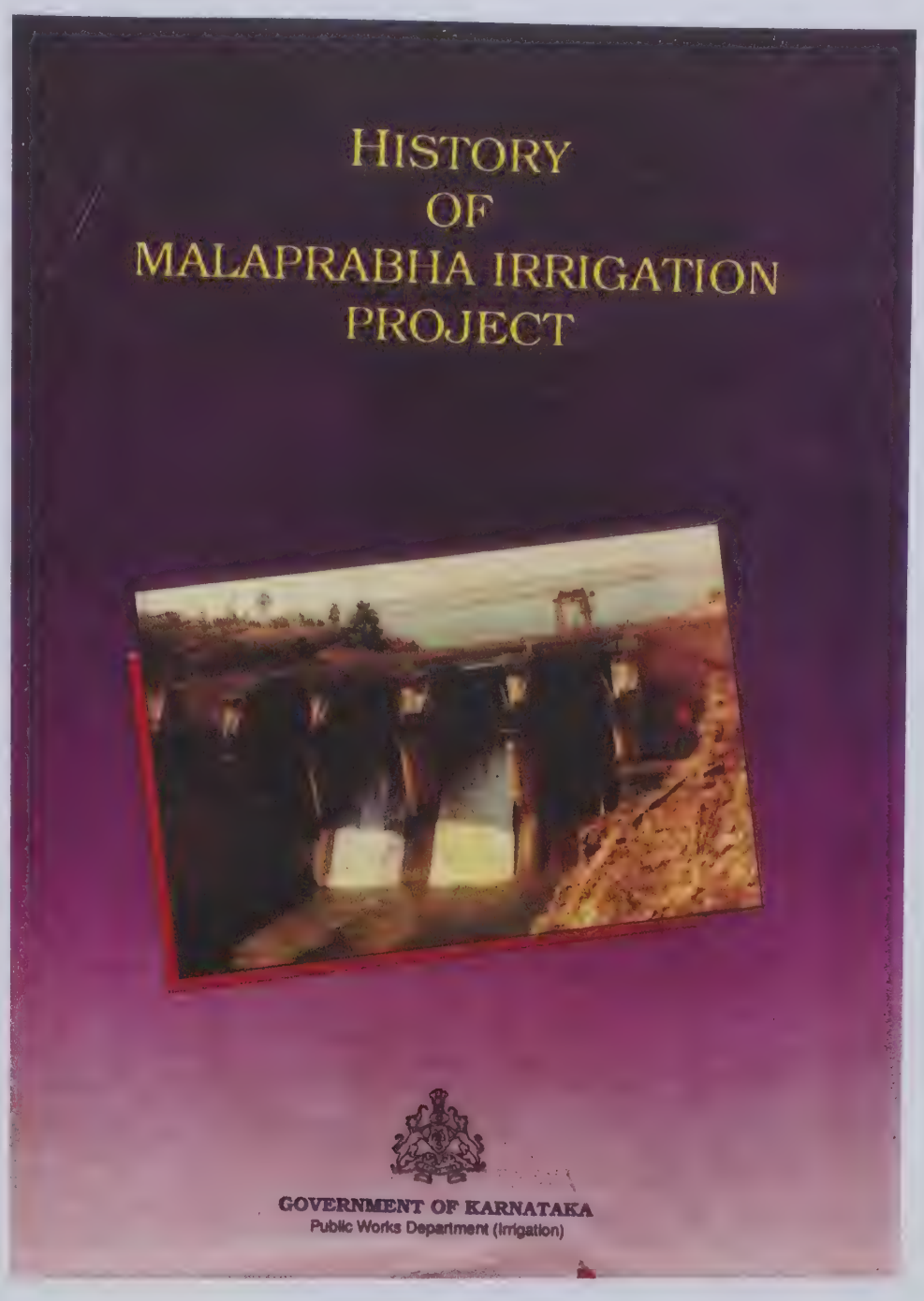
1099. The fact that the purpose of the two schemes namely Kalasa Nala Diversion Scheme and Bhandura Nala Diversion Scheme is to augment waters of Malaprabha reservoir for irrigation, is also evident from the "Recommendations of the Forest Advisory Committee (FAC) in its meeting held on 28-8-2003". The State of Karnataka has made available a copy of the letter No. 16-90/2017-FC dated 25th October 2017 of the Ministry of Environment, Forests and Climate Change as Enclosure-A2

command are threatening to blow up the pipes.

The Tribunal is of the opinion that blowing of the pipes by farmers of Malaprabha command is a problem relating to law and order, to be maintained by the State of Karnataka. Merely because the State of Karnataka is not in a position to handle law and order situation prevailing in Malaprabha command, as is admitted by it, it is not justified in laying its hands on waters of inter-State River Mahadayi. In fact, making of such a statement

on oath is shocking, disgraceful , disgusting, frightful, horrifying, nauseating, repulsive, sickening and scandalous. The failure to maintain law and order situation by the State of Karnataka in Malaprabha command area shows inefficiency of the State of Karnataka to rule the State and on this specious plea, diversion of water of inter-State River Mahadayi can never be granted by the Tribunal, to meet drinking needs of the Hubli-Dharwad and en-route villages.

Book Review & Extracts : History of Malaprabha Irrigation Project,1991



We must be thankful to the Govt. of Karnataka, Irrigation Dept. for publishing the above document in 1991. It places the entire Mahadayi Diversion issue in its proper perspective.

The Volume One of the book is a 302 page document with 12 chapters covering aspects like Hydrology, Construction, Canals, Tunnels, Socio-economic analysis etc.

In its Preface, Shri B.S. Rajanna, Chief Engineer, I.D., Belagavi (North) begins by writing, *"The foremost task of the present day engineer, for the survival of the mankind is the conservation of the limited quantity of water available."*

For the purpose of our report we are using only that part of this 'history' document which talks about the soil analysis, the cropping pattern, the goals set for the use of water from Navilu-teertha dam.

These issues are covered in Chapter – 3, titled *"Hydrology"*.On page 65 under the heading *"Soils"*, the first para begins by saying,

"The soils of the Malaprabha command are mostly deep black cotton soils particularly on the right bank...", and then the soils of left and right bank are analysed.

Then the section concludes by saying, *"By following the recommended cropping pattern, land capability classification, soil and land irrigability classification and by use of adequate fertilizers and improved varieties the agricultural production can be doubled."*

It is interesting to see the tables on page 72 and 73 where *Cropping Patterns* are described. The table on page 72 shows the percentage of irrigation to be used for the *Kharif* (Jowar, Maize, Bajra, Pulses and Ground Nut), two seasonal crops *Cotton* and *Chillies*, the perennial *Sugarcane* and the *Rabi* (Jowar Hybrid Maize, Wheat, Pulses, Safflower & other oil seed, Sunflower) crops.

It clearly states that 92% of water would be for the Kharif, Rabi crops and for Cotton. Only 8% each of irrigation is for Sugarcane in the three talukas of *Saundatti* and *Ramdurg* (of Belgaum District) and *Badami* (of Bijapur District) for the Left Bank Canal. Further 20% from the Lift Irrigation is allotted to Sugarcane.

The table on page 73 shows lists of crops as recommended by CWC and accepted and adopted by the irrigation department. This is clearly stated in points 10.2 and 10.3 on page 70 of the report

This needs to be contrasted with the present use of major component of the water > 75% of irrigation for Sugarcane!

10. CROPPING PATTERN

10.1. The cropping pattern as envisaged in the originally sanctioned project-

i) For Kharif crops	40% of irrigable command
ii) For Rabi crops	40% of irrigable command
iii) For two seasonals crops.	20% of irrigable command

This original sanctioned estimate provided for irrigation of 1,27,729 hectares only on the Right Bank Canal and was based on the soil surveys carried out by the Agriculture Department.

After the project was modified and provided irrigation for an area of 2,06,386.8 hectares by having (1) Left bank canal (ii) by extending Ko'chi canal and by (iii) Lift irrigation schemes, the Administrator, Malaprabha & Ghataprabha Projects, Belgaum, proposed following cropping pattern, given on page no. 71.

10.2. Further studies were made in respect of cropping pattern and taking into consideration existing crops grown, soil characteristics and rainfall pattern, cropping given on page no.72 was recommended as on of the alternatives and sent to Central Water Commission.

10.3 On the recommendations of the Central Water Commission the same has been further modified as on page no.73 and the same has been finally adopted as on page no.73.

BASIC FORMULAE AND SOURCES OF CLIMATOLOGICAL AND OTHER DATA

BASIC FORMULAE

The relationship between evapotranspiration i.e. consumptive use of crops and pan evaporation as given by Hargreaves is used for the computation of irrigation water requirements of crops. The relationship is expressed as

$$ET = K.Ep$$

Where, ET is the evapotranspiration;

K is the consumptive use of coefficient given by Hargreaves

Ep is computed pan evaporation.

Since observed data of pan evaporation are not available, the Water management division of Ministry of Agriculture has recommended the calculation of pan evaporations by using Christiansen formulae based on the climatological data. The formula is

$$Ep = 0.459\ R\ Ct\ CW\ Ch\ Cs\ Ce$$

Where, R is extra terrestrial radiation and Ct, Cw Ch,Cs and Ce are coefficients of temperature, wind velocity, relative humidity, percent of possible sunshine and elevation.

The method of working out Ep is described in detail in Chapter No.4 of the technical series No.2 "A" Guide for estimating Irrigation Water Requirements".

Page 73 : **There is no mention of Sugarcane Crop**

STATEMENT OF CROP PATTERN

(All figures in Hectares)

Name of crop	MRBC & Kolchi right bank canal extension	MLBC and LI scheme	Total
1.	2.	3.	4.
A. Existing crop pattern:			
1. Jowar	41016.3	22945.4	60724.26
2. Gr.nut	6835.9	3824.3	10660.10
3. Cotton	47852.6	26769.6	74622.18
4. Wheat	41016.3	22945.4	63961.70
TOTAL	136721.1	76484.5	213205.65
B. Proposed crop pattern:			
a. Kharif crops:			
1. Hy. Jowar	34180.9	7648.5	41829.3
2. Kh. Jowar	6835.9	-	6835.9
3. Pulses	6835.9	2656.3	9492.2
4. Gr.nut	-	15297.3	15297.3
5. Hy. Maize	6835.9	4991.3	11827.2
		TOTAL	85281.86
b. Rabi crops:			
1. Rabi Jowar	13676.6	6481.4	20157.92
2. Hy. Maize		4991.32	4991.32
3. Wheat	27344.2	12640	39985.22
4. Pulses	6835.9	2656.32	9492.17
5. Safflower	6835.90	3823.42	10659.27
		TOTAL	85285.91
c. Two seasonals:			
1. Cotton	27344.23	11473.49	38817.71
2. Chillies		3823.42	3823.42
		TOTAL	42641.13
	136725.18	76483.71	213208.89

Lt Gen Srikrishna C Sardeshpande

1934-2023

AVSM, UYSM, VSM, Rajyotsava Prashasti

Lt Gen S.C. Sardeshpande was the first to warn that diverting the Mahadayi River through projects like Kalasa–Banduri would dry up springs, damage forests, and lead to desertification in North Karnataka.

He stressed that without forest and catchment protection in the Bhimgad–Mahadayi basin, both biodiversity and livelihoods would suffer.

Through Paryavarni, the volunteer organisation founded by him at Belagavi in 1998, he mobilised local communities, led awareness drives, and submitted scientific reports to oppose diversion project proposals that lacked comprehensive ecological assessment. Mahadayi diversion in his view was environmentally disastrous and not just an interstate water dispute.

His groundwork in the forests of Khanapur taluka followed by proposals to the Government of Karnataka provided impetus to the formation of the Bhimgad Wildlife Sanctuary and its Eco Sensitive Zone.

The interstate Sahyadri Ecologically Sensitive Area (SESA) proposal admeasuring 10000 sq kms influenced national policy thinking, paving the way for the Western Ghats Ecology Expert Panel (2010) under Dr Madhav Gadgil. The Gadgil Report (2011), which recommended declaring the Ghats as Ecologically Sensitive echoed the holistic conservation vision Sardeshpande had championed years earlier.

Lt Gen Sardeshpande participated in the Indo-Pakistan war of 1971. His military valour and service to the nation was recognised with the Uttam Yudh Seva Medal - UVSM (For commanding the Indian Peace Keeping Force, Sri Lanka); Ati Vishisht Seva Medal -AVSM (Naga Hills Services); Vishisht Seva Medal - VSM (Bangladesh war). The Government of Karnataka conferred upon him the state's highest civilian award –Rajyotsava Prashasti, in 1996.

Shrikrishna C Sardeshpande was born at Munavalli village on the banks of the Malaprabha and spent his early years there. For a time after his retirement he lived in Belagavi thereafter moving to Dharwad, spending the rest of his time there.